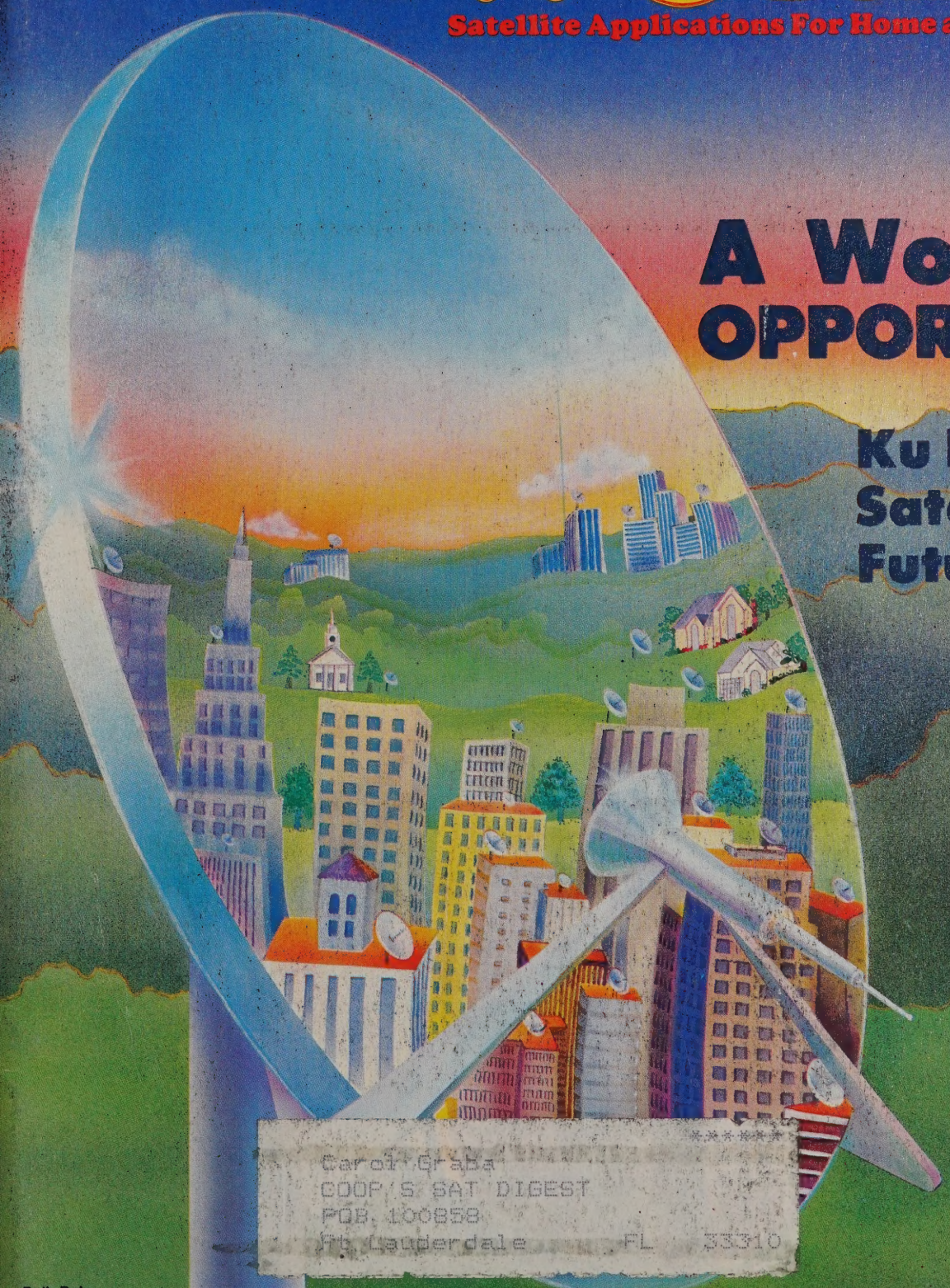
Ku-band WORLD

Satellite Applications For Home and Business

January 1986



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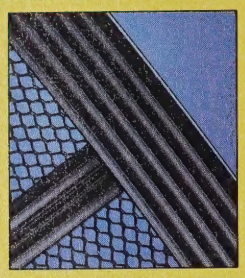
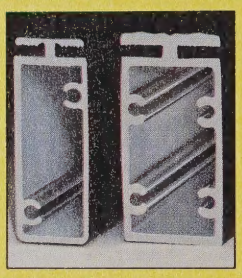


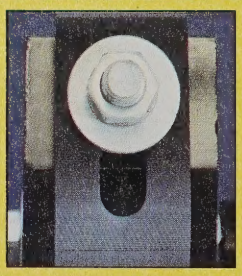
1

Sculptured reflector ring assures unmatched strength and parabolic shape.



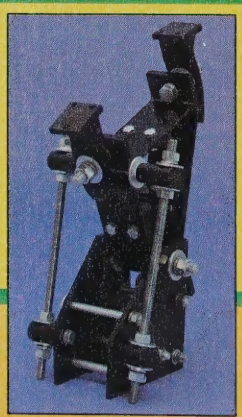
2

Four internal reinforcing channels while other antennas have only one or two.



3

Deep extruded ridges on *both* gripper panels.



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A World Of Opportunity

The promise of Direct Broadcast Satellite (DBS) services ignited a flame of excitement that fueled the investment of millions of dollars as the dream of a unique service failed to materialize. While cost considerations and the growth of C-band TVRO eroded interest in direct-to-home Ku-band entertainment services, Ku applications in business communications have flourished. The home entertainment market now, however, appears poised to achieve the expectations projected earlier.

Satellite direct services is a rapidly developing marketplace. In fact, it's a world of opportunity that is the focus of *Ku-band World* Magazine, the first magazine devoted exclusively to this expanding new satellite technology. The reality of opportunity presented in the concept of DBS for both home and business has not only survived, but it is thriving in applications for business, and the home entertainment market is rapidly developing.

The future clearly belongs to Ku-band.

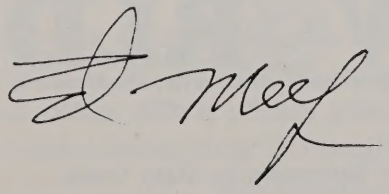
Planned satellite launches illustrate the transition from C-band to Ku-band technology. Through 1995, some 75 Ku-band satellites are planned while about 15 C-band satellites are scheduled for launch.

We at *Ku-band World* envision a merging of opportunities represented in the business communications and home entertainment markets. Each month, *Ku-band World* will trace the development of business television and satellite direct business services, and the emerging market in home entertainment. *Ku-band World* is your window to this world of opportunity.

Editorial focus for the magazine will acquaint readers in the business services sector with the growing opportunities both in business applications and home entertainment. It will also introduce home entertainment professionals to the home and business services market.

We invite your participation in *Ku-band World*. Editorial material contributed by manufacturers, value added resellers, satellite service vendors and other professionals is welcome. Photographs, both black and white, and color are also welcome for our technology review section.

In the development of this publication, it soon became clear that there is a great deal of misinformation regarding Ku technology, especially in the home entertainment area. Which systems will work? Which ones won't? How about hybrid Ku- and C-band systems? What are the technical requirements for Ku-band? These and other issues will be explored in the coming months. Your contributions will be valuable in this endeavor, so let us know what you know and what we can do to assist you.



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Satellite Applications For Home and Business

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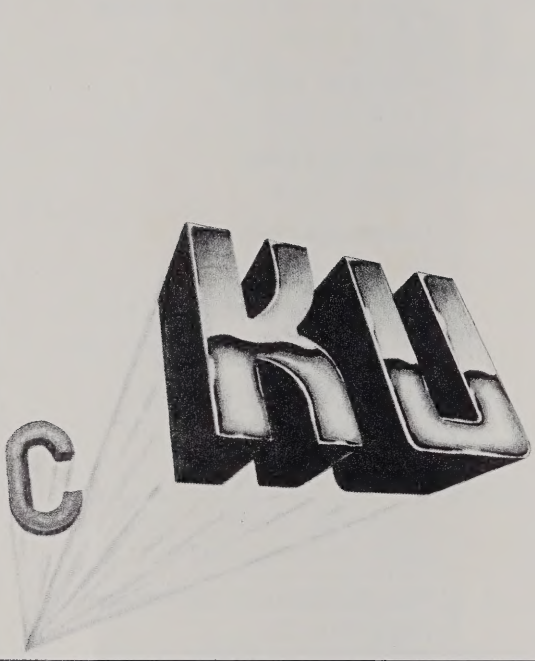

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ALL ITEMS PRICED SEPARATELY

Free World satellite communications has a new address, the Ku-band. The transition from C-band to Ku-band will take years, and the new marketplace will include both business communications and home TV entertainment—a potential cornucopia of opportunities.

A World of Opportunity

by John Brannon

Suddenly last summer somebody opened the gates to a new telecommunications territory.

As if on cue, satellite television home entertainment proponents are pouring through, each hoping to stake a claim in the new territory. Greener pastures never looked so good.

They call it Ku-band, the 12-GigaHertz frequency spectrum where the free world will permanently position its satellite communications. Conventional TVRO dealers, distributors and manufacturers hasten to learn something, anything, about it.

The Ku-band territory isn't new to one segment of the community, though. Business has embraced the technology which already represents millions in investment opportunities. Early forays into Ku-band home entertainment turned sour and millions of dollars and some careers were lost on what was called DBS. The idea was sound, they said, but was sidetracked by the development of small TVRO antennas for C-band, and rapidly advancing electronics technology.

The C-band, 4-GHz ground that spawned an aggressive and pervasive satellite TV communications industry may eventually be pushed aside. The upstart, Ku-band, is rapidly taking center stage.

The transition from C-band to Ku-band will take years, perhaps a decade or more. In the meantime, however, a rapidly developing new market opportunity in Ku- services for home and business is emerging and the two are certain to coexist for some time.

Never mind that C-band TVRO in a few short years overturned 30 years of TV technology and consumer habits. Overlook the fact that C-band needs fired the imagination of entrepreneurs, and bright minds with visions of electronic sugarplums burned the midnight oil in a quest to design the perfect antenna, LNA, polarotor and receiver. Ignore the collective power of a young industry so strong that Congress gave its official blessings, or that cable TV groups had nightmares about being shoved aside in favor of bigger and better technology that allowed everyone access to television programming, no matter where they lived.

Forget about all that.

A change of address is taking place. Free-world satellite communications—for whatever reason—has chosen 1985 to start moving lock, stock and transponder to the Ku-band. Some say it's a sure-fire, one-way trip, that C-band will be only a memory by the year 2000. Industry soothsayers point to the signs, such as scheduled satellite launches, as evidence. Between now and 1995, about 75 Ku-band satellites and only 15 C-band satellites are scheduled for launch.

The move to Ku-band is just and proper; some say that the benefits of Ku-band over C-band are so superior that the transition was inevitable. Rain may be an occasional problem for Ku-band transmissions, but what makes Ku-band superior is that much

smaller antennas may be used, some as small as 18 inches. Not to be ignored is the applicability of audio and digital use.

Whatever. The wagontrain has left, and NBC was the scout when it moved to Ku-band. In the process it took the Miami Dolphins broadcasts with it. C-band TVRO sports enthusiasts taken by surprise scurried to dealers asking for help. Most dealers knew nothing about Ku-band, and in turn asked distributors, who were equally at a loss. Manufacturers sent engineers back to drawing boards to design Ku-band systems that would hopefully reach out and touch a hefty percentage of the new marketplace.

The most basic rush, of course, is for equipment to receive Ku-band signals. An example of dealer frustration is the plight of Dan Wynne, former owner of Florida Satellite, Inc., a TVRO chain store. He attended the Nashville STTI/SPACE show, inquired about Ku-band products, and returned home disappointed. Then he assembled his own Ku-band system. Like the pioneers of the C-band industry, he quickly learned what will and what won't work. One month later, he displayed his Ku-band system with TV pictures from SBS3 satellite at the Orlando show, and compiled a list of about 200 TVRO dealers hungry for information.

But one major company active in the TVRO industry long ago laid its groundwork for Ku-band markets. DX Communications, Inc., Hawthorne, N.Y., produced Ku-band products designed for a DBS venture into the densely populated northeastern U.S. a few years ago. DX also designed and produced a Ku-band antenna for NASA when the U.S. and Canada joined together in an experiment and launched a Ku-band satellite.

"Many people are talking about switching to Ku-band, or C/Ku-band dual feeds, and because of that, there are many demands for Ku-band equipment, both from commercial people and consumer people," said Hero Sugiyama, president of DX Communications, Inc. "We have supplied equipment to all three major networks and news-gathering sub-contractors."

DX produces several Ku-band receivers, a Ku-band LNB (one for circular feeds and one for rectangular feeds), two feedhorns, and a Ku-band mounting bracket which can be used to add Ku- capability to an existing C-band system. Dick Gonzales, vice president of marketing, said, "The company has C- and Ku-band systems set up on a Paraclipse 12½-foot dish and a Raydx 10½-foot dish. Of course, we make our own Ku-band dishes as well."

DX's Ku-band antennas are a .75-meter offset, a .90-meter, and a 1.2-meter. "We believe that, from all research, that we have between six and eight percent of the (Ku-band) market," Gonzales said. "Our goal for next year will be between 10 and 15 percent of the entire market."

"The Ku-band is already a very large market in the area of business applications, and when you add the potential of home entertainment, it becomes a multi-billion dollar market, perhaps the greatest investment opportunity of our time," said Dr. Ed Meek, president of Opportunities Publishing Co., and publisher of *Satellite TV Opportunities* Magazine and *Ku-Band World* Magazine. "What excites me, and the reason we have established *Ku-Band World* Magazine, is those of us in the C-band market can grab a share of this tremendous opportunity right now, and hold on and enjoy its growth. C-band dealers, distributors and manufacturers are ideally positioned for the home entertainment

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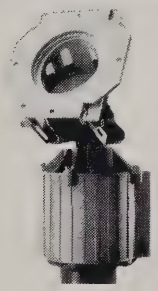

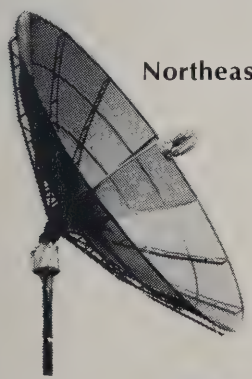

Northeast Satellite Antenna

This high gain satellite antenna with its heavy duty expandable aluminum mesh screen is definitely top of the line equipment.

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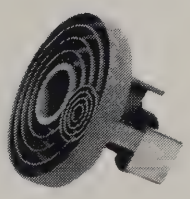
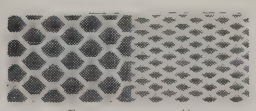


This aluminum feed has a frequency range of 3.7-4.2 GHz or 11.7-12.2 GHz with VSWR 4GHz 1.45 max or 12GHz 1.30 max.

Seavey ESR 120 Ku Band Antenna Feed

This aluminum antenna feed has a frequency range of 11.7-12.2 GHz with VSWR 1.30, maximum



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market, and can play a significant role in the business television market."

Just as C-band TVRO catered to insatiable appetites of an entertainment-hungry TV consumer, Ku-band receiving systems will fill the teleconferencing, voice, and data demands of the business community. And do it with style.

Some of the high-tech business TV firms are Hi-Net, Private Satellite Network, Arianespace, Omninet, TeleSat, Alcoa-NEC, General Instruments and Scientific Atlanta. Their style includes precise technological know-how and a pragmatic business approach to fulfilling the telecommunications needs of their customers.

"The satellite medium is going to be very important to the business communications area over the next several years," said James A. Hart, vice president, Communications Products, Scientific-Atlanta. "It is a reality. It's a worldwide reality, not only in the U.S. The B-MAC technology and the rest of the Echelon products are going to be very important in the coming years in setting up point-to-multipoint business communications networks. There's going to be growth in the area, and we see the Fortune 500 utilizing this technology, including video data—one-way, point-to-multipoint, and then growing into two-way data communications."

"Echelon" is Scientific-Atlanta's family of products "that represent everything from video network to a two-way data network, or any combination of that, structured specifically to serve the business community."

Business applications of satellite telecommunications appear unlimited, almost a golden promise of improving the daily business communications of free enterprise.

In one such application of Ku-band technology, sales seminars and other business meetings won't require airline tickets and packing of travel bags.

Simply go to a conference room, dim the lights, and watch a wide-screen presentation from corporate headquarters downlinked from a Ku-band satellite. Richard Neustadt, senior vice president and general counsel, Private Satellite Network, said the scenario is only one of many uses of Ku-band technology. Neustadt prefers the term, "business television" for such applications instead of "video-conferencing," which he says causes confusion. "I use that term to describe both point-to-point digital two-way systems, and point-to-multipoint analog broadcast systems," Neustadt said.

PSN markets private internal television network services to large organizations throughout the country.

"A company that has offices scattered around the U.S. can use one of these systems to broadcast live TV out to its people," he said. "Receive antennas are installed on-premises so people won't have to go anywhere to physically participate in the program. PSN is operating these networks for a range of large corporations in the U.S. and Canada, and soon will be sending this service overseas. We have upwards of 400 Ku-band systems in operation today, which I guess makes us the largest Ku-band network in the U.S."

Neustadt recently announced that PSN has chosen Scientific-Atlanta's B-MAC encryption system to provide privacy and signal security to its business TV customers.

Tony Spiddle, business manager, Inland Satellite Services, British TeleComs, says his company has "been looking at the growth of the Ku-band, and the abilities are endless. We're going inland, in-Europe services, in small terminals that can be customer-located. The use of home entertainment and letter industries are in fact the driving forces of the market. They're the ones who can and will afford to take advantage of this. There's a major client who provides a letter industry service to upwards of 18,000 earth stations in the United Kingdom alone with full video, particularly with the encryption systems, multiple addressable audio systems and data throughout the UK, and a major group of cable operators. We've got an enormous customer base of receiving equipment, and that base is trying to convert over into scrambler systems.

"In western Europe there is an enormous communications system based on C-band, and little possibility of growth there, so we take Ku-band. The next stage is hotels using Ku-band and the B-MAC system."

But it's not limited to traditional free-world countries. Sidney Topol, Scientific-Atlanta chairman of the board, recently returned from a round-the-world trip through Europe, Africa, the Middle East and China. "Every country, large and small, expressed an interest in satellite communications," Topol said.

Continued on page 19

HANDS-OFF POLICY

Dean Burch, former chairman of the Federal Communications Commission, said the government should adopt a laissez faire policy when it comes to technological growth. "Technology has always been powered by men, brains and money," Burch said. Burch recently joined the Board of Directors, Omninet Corporation, Los Angeles.

RSI ENTERS TVRO

Radiation Systems, Inc., Sterling, Va., is in final steps to acquire Laux Communications, a Cincinnati, Ohio, TVRO manufacturer. The addition of Laux means RSI will add another segment to its existing six fields of communications engineering products. RSI recently announced earnings of $783,000 on sales of $7.3 million in the three months ending Sept. 30, 1985.

INSTITUTIONAL DBS

Private Satellite Network, New York, coined a new name for exactly the kind of services it offers: Ku-band networks for private corporations. "Institutional DBS" is the name given business communications networks that pass video and data traffic via satellite uplink/downlink to very small aperture earth terminals (VSAT).

KODAK GOES KU

Now comes Kodak, planning to link about 60 of its locations to a Ku-band point-to-multipoint network. Paving the way were Hi-Net with about 1,000 hotels, and MicroAge and Merrill-Lynch with about 500 locations. David Green, director of sales and marketing, VideoStar Connections, noted that business communications will be the leader of Ku-band, just as HBO is the leader of C-band.

SCRAMBLING IS GOOD BUSINESS

In the business communications arena, scrambling seems good business. British TeleComs, the Australian Department of Communications, Hi-Net, and others have chosen Scientific-Atlanta's B-MAC (Multiplex Analog Components) encryption systems to provide privacy and signal security to their systems. And the Chinese have been to Atlanta for a first-hand demonstration of B-MAC. Transmit a signal and somebody will intercept it. But if it's scrambled, who cares?

CYGNUS LAUNCHES SATELLITES

Cygnus Satellite Corporation was granted authority recently by FCC to build, launch and operate two satellites (43 and 45 degrees West) to be operated in a system in the North Atlantic region.

TELESAT SCHEDULES DBS VIDEO

DBS video services to about one million customers throughout Canada using Anik C3 satellite are scheduled for fall 1986, according to Ben Bonneau, manager, Anik Systems Division, Telecommunications Services, TeleSat-Canada. Bonneau said that because of a recent agreement with TeleCom-Canada, TeleSat is able to offer its services directly to consumers. TeleSat has been providing video, data and other services to major Canadian networks, such as Radio Canada, CBC, and Global Network. With the direct-to-home DBS network, remote communities will be able to receive quality programming the same as urban communities. Included are pay-TV channels, CBC, and educational programs. Initially, TeleSat will use available space on fixed Ku-band satellites to initiate DBS services. Plans call for eight channels in East Canada and eight in western Canada.

Ku-band technology provides a wide range of business communications, but can satellites do something as basic as keep tabs on an important truck shipment or notify a hospital in a medical emergency? According to the people at Omninet, they can . . . and they will.

Communications For All

by John Brannon

Exotic but practical applications of Ku-band satellite technology already exist, operational both in home and business functions.

Others are past the drawing board, awaiting licensing by the Federal Communications Commission, which allocates operating frequencies and establishes regulations.

An example of the telecommunications technology is the Mobile Satellite System (MSS) envisioned by Allen Salmasi and his colleagues in the creative caverns of collective minds at Omninet Corporation, a Los Angeles-based firm. Salmasi is Chairman of the Board and Chief Executive Officer of Omninet.

Having brought his dream to fruition and reality, Salmasi beams with his own brand of sunshine on a cloudy day. With good reason.

Consider this scenario.

An 18-wheeler tractor-trailer freighthauler is hijacked on a lonely stretch of interstate highway between Dallas and El Paso. Hijackers divert the truck and its $75,000 cargo to a remote site. They are stunned a few hours later when lawmen swoop in and capture them and reclaim the truck and its cargo.

Wondering whom among them snitched, the thieves suspiciously eye each other.

Little did they know, but the 'snitch' was a palm-size antenna installed in a special box mounted on the roof of the tractor (cab). The thieves had run headlong into the heart of Omninet's RDSS—Radiodetermination Satellite Service.

The truckline was a customer of the service, and among other RDSS features, could routinely obtain a location ("fix") of each specially-equipped truck of its fleet anywhere in the country in a matter of seconds. When the truckline headquarters noted that one of its trucks had been diverted off its route without authorization, action was taken to plot the truck's route of travel. Even though the hijackers hid the truck, it was still "seen" by a satellite, and its location calculated to within a few feet. Area law enforcement agencies were notified and kept informed by the truckline headquarters.

The above scenario is only one of several applications of the Omninet MSS program.

RDSS will offer "an optimum mix of RDSS services to commercial and individual users, and will also offer presently unavailable life and property-saving services to hospitals, public safety and law enforcement agencies, disaster relief and other emergency service organizations, according to Daniel McCue of Freeman/McCue Public Relations."

Omninet has applied to the FCC for licensing of both the MSS and RDSS programs, making a proposed frequency range for each. But the systems won't be operational until special satellites are constructed and launched. It takes about three years from FCC approval to being fully operational, which would place the MSS/RDSS activation about mid-1988.

Ground stations must be constructed and equipped to manage the programs. Charles Marantz, executive vice president and chief financial officer, Omninet, said the estimated costs of the two programs will range in the hundreds of millions of dollars.

Two special satellites called STARSAT will work in combination with the federal government's NAVSTAR Global Positioning System (GPS) to provide accurate position location services.

"They're both very highly specialized satellites that will not be using Ku-band frequencies for the user links, but other frequencies to provide services that have not been provided by Ku- or C-band frequencies," Marantz said. "As a result, they'll be much more sophisticated than conventional Ku-band satellites."

William Curry, vice president,

Satellite Systems Engineering, Omninet, said the RDSS program will use L- and S-band frequencies, which are:

Uplink (L-band)—1610.0 to 1626.5 MHz

Downlink (S-band)—2483.5 to 2500.0 MHz

"The allocation of these frequencies by the FCC has been accomplished," Curry said.

"The MSS operating frequencies have been proposed to FCC, but have not been approved and allocated. Those frequencies are:

Uplink (L-band)—1650.5 to 1660.5 MHz

Downlink (L-band)—1549.0 to 1559.0 MHz

"The UHF portion is 821.0 to 825.0 MHz for uplink, and 866.0 to 870.0 MHz for downlink," Curry said.

The applications we have submitted to FCC are for the longer-term STARSAT system," Marantz said. "In the meantime, it's our intention to provide initial services. We do not have to construct, launch and operate our own set of Ku-band satellites. We're going to make use of existing and future capacity satellites launched and operated by other parties. The STARSAT system is still in the future. However, we are pursuing a number of different opportunities,

Continued on page 50

Hi-Net Converts To Ku-band

TVRO systems at all Holiday Inn affiliate hotels served by Hi-Net Communications Satellite Broadcasting Services, are being replaced by Ku-band systems with transmit capabilities, according to Fred Del Toro, senior vice president, Hi-Net Communications.

The telecommunications upgrading program carries a price tag of about $100 million.

Scientific Atlanta's B-MAC encryption system has been selected to provide signal security for the Hi-Net satellite services network.

"Hi-Net is essentially an entertainment network that provides movies, news, and sports programs to affiliate hotels across the country," Del Toro said. "We have constructed a satellite access facility in Memphis where we have two Ku-band transmitters, one beamed east and another west. We also have C-band antennas where we're taking signals off SATCOM III-R and Galaxy I, and turning them around and sending them back up on Ku-band."

The Memphis facility has a broadcast operations center, which is a combination of a video playback facility and TV production studio. "We're originating our own programming for Hi-Net entertainment called 'Satellite Cinema,' and a pay-TV service in the evenings."

Six channels of programming are being transmitted, and for that reason, Del Toro said, signal security was vital. Hence, the selection of Scientific-Atlanta's B-MAC encryption system.

"We settled on B-MAC as the system that could do the best job for Hi-Net, not only from the standpoint of protecting our entertainment programming signals, but our Satellite Cinema signals as well," Del Toro said.

"With B-MAC, we've got all sorts of expanded capabilities—voice, data, satellite music service—which we will be offering as part of our basic package. We are very pleased with our association with Scientific-Atlanta and what it's been able to offer us. Of particular benefit to Hi-Net is that Scientific-Atlanta is very pragmatic, and they have an excellent attitude toward servicing their customers. Since we're involved in a major program, that really works well for us."

The "major program" referred to is the 1,000 hotels signed up for Hi-Net services, he said. About 500 are expected to be on line by year's end, and 500 more by March 30, 1986.

"We envision ultimately a network of 3,000 locations scattered coast to coast and border to border, and that will be a network that will be voice, data, video, etc. We are primarily domestic, but we are already looking to establish in Great Britain and the Caribbean, so we'll be moving into the international area," Del Toro said.

Holiday Inn has always been the lodging industry leader in utilization of television services. Black and white TVs were installed in each room in 1959, and a decade later set the industry pace by placing color TVs in each room. In 1979 the corporation established Hi-Net Communications, Inc., and "moved into the era of Space Age communications."

The network's first satellite earth station was installed in Memphis in October 1979. Plans were for the network to gradually grow until each hotel in the continental

Holiday Inn's Hi-Net Communications is switching to Ku-band. The satellite broadcasting system provides entertainment to affiliate hotels across the country as well as hotel industry education and training, videoconferencing, and special events.

U.S. had its own satellite earth station.

"This objective was driven by the strategy of providing premium TV entertainment programming such as cable movies and sports to Holiday Inn hotel rooms in the most cost efficient manner possible," Del Toro said. "Options considered in accomplishing this objective were local cable TV feeds, in-house videotape systems, and direct-to-hotel satellite delivery."

Local cable TV and in-house videotape systems were not chosen because they weren't cost efficient. "Thus, even though satellite communications was in its commercial infancy in 1979, it was deemed to be the technology that was most compatible with our strategic plan and objectives."

By the end of 1984, 371 satellite earth stations were operational within the Hi-Net network, comprising 24 percent of domestic hotels and 28 percent of domestic rooms.

In October 1984 a new plan was finalized, based on five years experience with satellite communications technology. It called for an initial $60 million capital investment. To effect the plan, a joint venture was formed Dec. 31, 1984, between Comsat General and Hi-Net Communications, Inc.

The plan called for:

a. Design and construct a Ku-band satellite communications network at hotels throughout the continental U.S.

b. Install a commercial grade Ku-band satellite earth station (initially TVRO) with upgrade capability to transmit/receive.

c. Install a computer-addressable pay-TV system at each hotel.

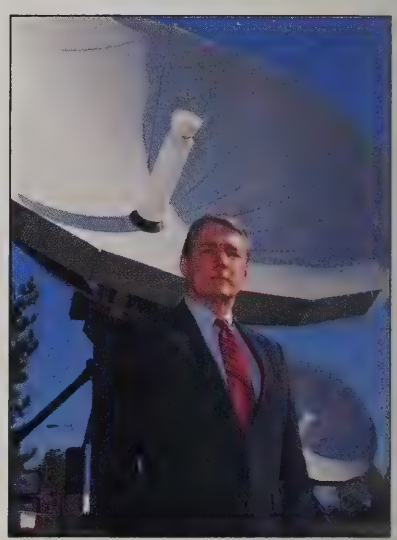
d. Provide four channels of satellite-delivered entertainment programming: Channel 1, Showtime movies and specials; Channel 2, CNN Headline News; Channel 3, ESPN; Channel 4, Satellite Cinema, a customized pay-TV service, nighttime only.

Channels 1, 2, and 3 are free to the guest. Channel 4 is pay-TV, but in daytime is BizNet News, WTBS the Superstation.

Another major element of the plan was to broadcast entertainment programming, hotel industry education and training, videoconferencing and special events from a venture-owned satellite access facility in Memphis.

Construction of the satellite earth stations and pay-TV systems at affiliate hotels began at the end of August 1985. "We started transmitting four channels on Sept. 1 and all six channels on Oct. 1."

Hi-Net uses Ku-band transponders on G-Star I satellite.



Bill Goforth, president, Hi-Net Communications.

Hi-Net communications control center.

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Communications The World Over

Worldwide interest in satellite communications is about to reach orbital heights in Europe, the Middle East, Australia, and even China.

"The interest is extremely high for television in European and Middle East countries, and for television, voice, and eventually data, in China," said Sidney Topol, Scientific-Atlanta chairman of the board.

Topol recently returned from a world trip in which he spent several weeks in China in negotiations about furnishing Scientific-Atlanta communications and instrumentation equipment to the Chinese.

"It was clear to me that China had to be a big market for satellite communications. They're going at it in several different ways. One is the user groups, the various ministries, which would be like corporations here; all need communications. Secondly, the Bureau of Astronautics in China is building its own satellites. They've built and launched and are operating a C-band satellite, and they're leasing C-band transponders from IntelSat. They want to build an industry themselves in their own country, both the spacecraft industry and the ground segment industry. However, they're very interested in cooperating with American companies, and are buying equipment and making all kinds of technology transfer arrangements. I think they'll eventually be C-band and Ku-band, and they could very well be a potential B-MAC customer of ours," Topol said.

Topol said the Chinese are moving toward a market-based society, where the marketplace decides what will be built or bought, instead of relying on state-controlled planning. "For example, they have openly said that they will have three ministries to compete in building TVROs.

"Our main thrust is to be a major communications company. That's a *major* communications company, whether it's for satellite or cable, and we clearly see the trend toward digital and time division multiplexing. And the multiplexing of voice, video and data on single transmission medium, whether it's cable or whether it's satellite. And we see the trend toward time-division multiplexing."

C- and Ku-bands will co-exist, he said, and there'll always be a place for each, just as there is VHF and UHF, AM and FM.

"One of the advantages of Ku-band is that you can avoid terrestial interference, and you can locate the dishes right in the middle of the cities, and they can be much smaller. And if you can get the volume up, they can be approximately cost-competitive with C-band because of the smaller area. C-band will always be used, because it's there, more impervious to rain, and the components for the present time are readily available."

Scientific-Atlanta currently sells about $5 million in equipment to China annually. The key to dealing with the Chinese, Topol said, "is patience, patience, time, and understanding. Also, you've got to have a good representative."

During the China visit, Topol attended the U.S. Telecommunications Conference in Peking. The conference was sponsored by Bell-South Corp., Atlanta, and China-Tech, a joint venture between Georgia Tech and China. About 45 American companies attended the conference.

Sidney Topol, Chairman of the Board, Scientific Atlanta

World of Opportunity

Continued from page 10

Meanwhile, back on familiar C-band TVRO turf, manufacturers are producing Ku-band products to give satellite TV consumers the equipment to watch Ku-band programming. And the numbers are lucrative, said DX's Hero Sugiyama. "With a three- or four-foot dish, you can go into a suburban market," he said. "Right now, the difficulty that TVRO dealers have in a suburban market is the size of the dish and telephone line interference. Because of that, there is much difficulty in procuring a suburban market at C-band. But at Ku-band, you can get a decent picture with a smaller dish and you don't have TI. I think that will open up a very big suburban market. With C-band we are talking about 1.5 million, but if you open up the suburban market, we are talking about several million. But to make it happen, there has to be programming (at Ku-band)."

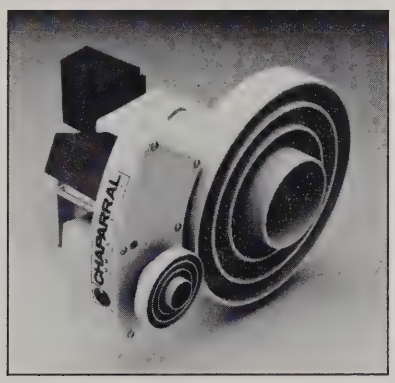
Long's Electronics, a Birmingham major TVRO distributor, will stock Ku-band products, according to Jimmy Long, owner. "We're excited about that," Long said. "Ku-band would already have been here had it not been for some unwarranted publicity along with some premature business failures. Ku-band is long overdue. I look forward to it with great excitement. It just makes sense."

Larger producers like Luxor also are adjusting for the Ku-band market. Randle Harman, national sales and marketing manager, Luxor, said the company's initial entry into the satellite business was in Europe about four years ago. "Sweden was Ku-band," Harman said. "That was the initial introduction, as far as Luxor was concerned, and that was to address the Ku-band market.

"What you're going to see from us, all our block systems that we offer are Ku-band ready. We've had our Ku-band dish available. We're trying to get a feel for the marketplace here in North America. So we're trying out the market, and the initial onslaught of Ku-band is going to happen. It's here. It's just, 'How big is it?' "

Luxor's Ku-band products include its 9900 block satellite receiver.

Mark Sheldon, marketing manager, Chaparral Communications, said the history of satellite TV has been that people who had TVRO antenna systems wanted to watch *all* the satellites. "I think it adds to 4 GHz," Sheldon said. "It's just an added frequency and more satellites, an augmentation of what we've already got."



Chaparral's feedhorn

Chaparral has designed and built three feedhorns for Ku-band—a superfeed, which is a single polarity feed; a Ku-band polarotor; and a Ku-band dual feed with Orthamode. "When we're talking about Ku-band, we're really talking about a worldwide subject," he said.

"Virtually any dish can receive Ku-band as well as C-band. There are some differences in terms of surfaces. There's the mesh-versus-solid issue, but they still will reflect a signal right to a focal point. And there are some issues regarding F-to-D ratios, which means the depth of the reflector. But basically, any dish can. When you get into larger dishes, 10 or 12-feet in diameter with good reflector surfaces, you can, in many cases, mount the Ku-band feed offset from the C-band feed. You put the C-band feed on the focal point, and then mount the Ku-band feed beside it.

"Essentially, our products and the way we perceive the business is feeds—it can be used either prime focus or offset at either frequency. That's what we're building. I'm not guaranteeing that a guy can use our offset on his 6-foot dish. When you buy the 12-GHz polarotor, you get a package which allows you to mount it prime focus or offset. So the feed is not designated to be offset only."

Another of Chaparral's products is the Sierra receiver, which is both C- and Ku-bands compatible.

Seavey Engineering Co., Cohasset, Mass., was established in 1981 and has done Ku-band work since then, according to John Seavey, president. "We have produced all the Ku-band hardware that is in common use today," Seavey said. "We are engineers and developers of this equipment, as well as manufacturers, and we are continuing to develop this hardware as needs arise." One of Seavey's better-known products is the Ku-band feedhorn.

Seavey said that his firm has joined with PICO Products, Inc., Liverpool, N.Y., to produce Ku-band products. "After the tooling process is complete, both PICO and ourselves will be offering high-volume quantities of this feed hardware on the threshold end.

"Business applications of Ku-band hardware is our primary interest. We are not so

Continued on page 34

SATELLITE OPPORTUNITIES EXPO Slated for April 6-8

The nation's first Ku-band trade show and conference bringing together satellite business services and home entertainment will be held at the Opryland Hotel in Nashville, April 6, 7, and 8.

The SATELLITE OPPORTUNITIES EXPO for Home and Business is jointly sponsored by Opportunities Publishing, Inc., publishers of *Satellite Opportunities* Magazine and *Ku-band World* Magazine, and The University of Mississippi Center for Telecommunications.

The show is expected to attract 10,000 participants from both the Ku-band and C-band markets with a dual conference track devoted to satellite-direct business applications and satellite applications in home entertainment.

"The OPPORTUNITIES EXPO and conference is one of the most exciting communications events of the year. The satellite-direct business market is already huge and the home entertainment market is rapidly developing. The application of C-band and Ku-band technologies represents billions of dollars in opportunities both in domestic and international markets," said Dr. Ed Meek, Opportunities Publishing president.

Dr. Meek said the names of major corporate groups who will join in sponsorship of the expo and conference will be announced later.

"We are extremely pleased to have a major university, The University of Mississippi, join us in offering this event. Additional sponsors will include some of the nation's leading corporate groups in both Ku and C-band technology," Dr. Meek added.

The SATELLITE OPPORTUNITIES EXPO will offer a special conference track for corporate and business users and prospective users of satellite services as well as for manufacturers and suppliers of Ku and C-band products and services. Speakers will include government and corporate policy makers, business service users and industry representatives. The home entertainment track will focus on the rapidly developing Ku-band DBS market and C-band DBS.

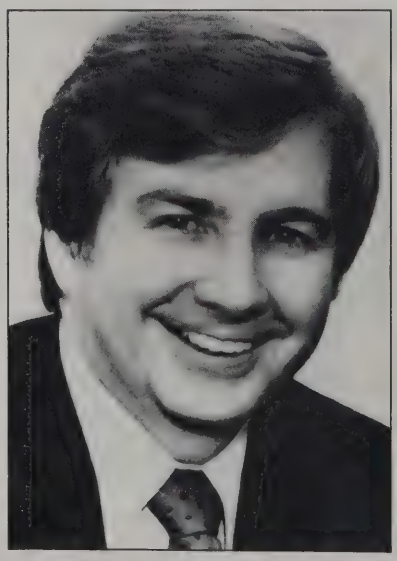
More than 400 exhibitors are anticipated for the Expo.

Pre-registration for participants as well as exhibitors should be made as soon as possible. Rooms at the Opryland Hotel should be reserved early and should be made directly with the hotel.

See pages for pre-registration forms for both participants and exhibitors.

White House's Larry Speaks Keynote Speaker

Assistant to the President Larry Speakes will be the keynote speaker at the Satellite Opportunities Expo and conference in Nashville, April 6-8.



Larry Speaks

This is the first time a presidential assistant has participated in a satellite exposition and conference.

The Satellite Opportunities Expo for Home and Business is sponsored by The University of Mississippi and Opportunities Publishing, Inc. Approximately 10,000 participants are expected for the program which includes a national conference on Ku and C-band satellite services for home and business. More than 400 exhibitors are anticipated.

Reservations for attendees and exhibitors should be made with Opportunities Publishing, Inc., 305 W. Jackson Avenue, Oxford, Ms 38655, phone (601) 236-5510.

KU TV WITH DESCRAMBLER

RCA and M/A-Com will develop a television set with a built-in Ku/C-band receiver and descrambler. A prototype was unveiled in a timely demonstration designed to bring new attention to M/A-Com's VideoCipher II descrambler and the relationship between RCA and M/A-Com.

No date for production of the new system was suggested other than an indication that no consumer units are expected to be available in the next year.

SIERRA SEES CHANGES AT CHAPARRAL

The introduction of the Sierra receiver by Chaparral has brought about changes and growth for the company.

Sierra is Chaparral's new Ku/C-band receiver.

President Bob Taggart says Chaparral "has really grown. Our new engineering and Sierra test facility is now complete. We have added many new employees with wide-ranging talents.

"The Sierra system is being delivered now, and with it comes our commitment to every individual who chooses Chaparral."

NCTA RESPONDS TO SPACE

The NCTA, through president James Mooney, fired off a letter to the Congress outlining the cable association's thoughts on the scrambling issue following intense lobbying on Capitol Hill by SPACE members.

Mooney assured Congress that while primary signals will be scrambled, there is no effort to make the skys go dark and limit dish owner access to decoders. Decoders will be readily available to the public and both retailers and cable owners will have the opportunity to sell equipment.

Absent from Mooney's comments was any reference to the average $4.50 fee paid by cable operators for HBO and the movie service's announced price of nearly $13 for the same service to dish owners.

100,000 DESCRAMBLERS

As Showtime/The Movie Channel announced plans for the testing of scrambling equipment to begin during January, company officials indicated they had been assured by M/A-Com that 100,000 home decoders will be in the "pipeline to hardware dealers prior to our anticipated May deadline for full-time scrambling."

The company said it had urged M/A-Com to seek the broadest possible distribution of decoders and indicated marketing plans to serve the TVRO market are being finalized.

NEW MARKET FOR C-BAND DEALERS

The Ku-band home entertainment market, even though in its infancy, offers add-on sales for C-band antenna dealers. "Also, if you look at the market as a world market instead of just a local market, the world market is much bigger when you combine Ku and C-bands," adds Paul Arenz, vice president of Multi-Sat Communications.

Arenz said his company has sold units to Australia, feeds to India and England, and are looking to make sales in Iceland. Multi-Sat has been displaying its all-mode TVRO system, Star Master I.

DOWNLINKING OPPORTUNITIES

Lexington TVRO dealer Paul Aubrey installs both home and commercial systems but is adding income to Galaxy Satellite Services through Ku and C-bands downlinking services.

"Dealers should go to as many Ku-band seminars as they can and pick up as much information as possible and start selling Ku-band and offering Ku downlinking service to major corporations," Aubrey advises.

RELIGIOUS PROGRAMS

Religious programming may be far more popular than previously expected.

A. E. Nielsen Co. in its recent audience sweep estimated as many as 61 million people watch the top 10 satellite-based religious shows.

The study was conducted for CBN Cable network.

The average daily audience for CBN's "The 700 Club" was 4.4 million with weekly estimates of nearly 13 million viewers, double what the network had previously estimated.

Engineer John Seavey tells how to add Ku-band feeds and LNC's to a TVRO system, and gives pointers on antenna installation and alignment.

How To Modify TVRO System For Ku-band Operation

by John Seavey

With the availability of entertainment and sports programming on Ku-band satellites comes the incentives for using new Ku-band hardware. Successful operation of a TVRO installation is being done every day by relatively simple modifications of standard C-band equipment.

In spite of the higher path losses on the downlink and the relatively poor surface tolerances and pointing accuracies of C-band antennas, good results are being reported by most users. This article describes how to add the Ku-band feeds and LNC's to your TVRO system and some pointers on what to look for in the way of installation and alignment of the antenna.

Present Ku-band satellites employ very high power transponders and somewhat smaller footprints, thus yielding EIRPs in the neighborhood of 48 dBw. Polarizations employed for U.S. domestic satellites are orthogonal linear; circular polarization is employed on several European satellites. Frequencies for the downlinks are 11.7-12.2 GHz for U.S., 10.95-11.7 GHz for Intelsat and Eutelsat satellites and 12.2-12.75 GHz for the Aussat satellites.

To receive Ku-band signals, you must replace your present antenna feed with a dual-band feed and add a separate Ku-band LNC. Several different types of dual-band feeds are available, differing in their polarization and beam alignment characteristics. Commercially available LNC's are becoming common in Ku-band; a popular unit is the DX Model DSA-504-3R unit, which offers the specifications shown in the box.*

The equipment is connected in the basic arrangement shown in Figure 1. The new Ku-band LNC is connected

SPECIFICATIONS
DX-COMMUNICATIONS, INC. MODEL DSA-504-3R
LOW-NOISE BLOCK DOWNCONVERTER

[(*) Model DSA-504-2R has an output frequency or 900-1400 MHz It is recommended that you check to verify the IF frequency of your receiver when making the LNC selection]

Input Frequency	11.7-12.2 GHz
Output Frequency	950-1450 MHz (*)
Input Waveguide	WR-75
Noise Figure	3.2 dB, max.
Conversion Gain	50 dB
Required Voltage	15-24 VDC @ 200 mA.
Output Connector	F, female
Size	7" long, 3" diameter
Weight	2.5 pounds

to the receiver through an A/B switch, thus allowing the receiver to alternately receive the C or Ku-band signal.

There are several precautions which the user should be aware of when adding the Ku-band gear. Some of these stem from factors inherent in the use of 12 GHz signals; others arise from limitations of the existing C-band antennas. By inspecting your present antenna, you can determine if problems at Ku-band are likely to happen.

Obviously, you must be within the satellite's footprint to receive the signal. Ku-band satellite footprints are generally smaller than those at C-band and inspection of available footprints will indicate this information. From a standpoint of downlink signal budgets, the following system parameters may apply:

Assume an 8-foot diameter C-band antenna with a 100K LNC, a receiver operating with a 25 MHz IF bandwidth and an 8 dB C/N threshold. This system will operate well within a footprint having about 32.8 dBw power density. If this same antenna is used at Ku-band, we might expect the following signal budget to apply. With a 48 dBw downlink power density, a 300K LNC (about 3.1 dB noise figure) and the same IF bandwidth, and with an allowance of about 3 dB for a rain attenuation margin (which is necessary at 12 GHz but which is minimal at 4 GHz), only about 3.2 feet of the 8-foot aperture is required. This indicates that some degradation in gain of the antenna can be tolerated with respect to a perfect reflector.

Figure 1
Basic C- and Ku-Band TVRO System

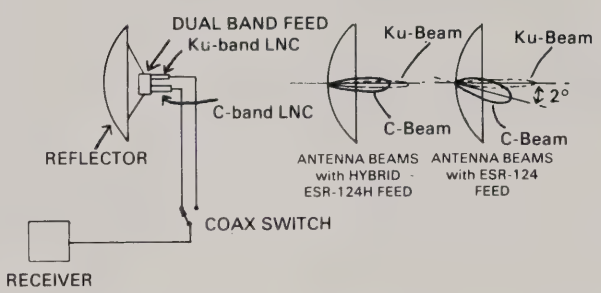
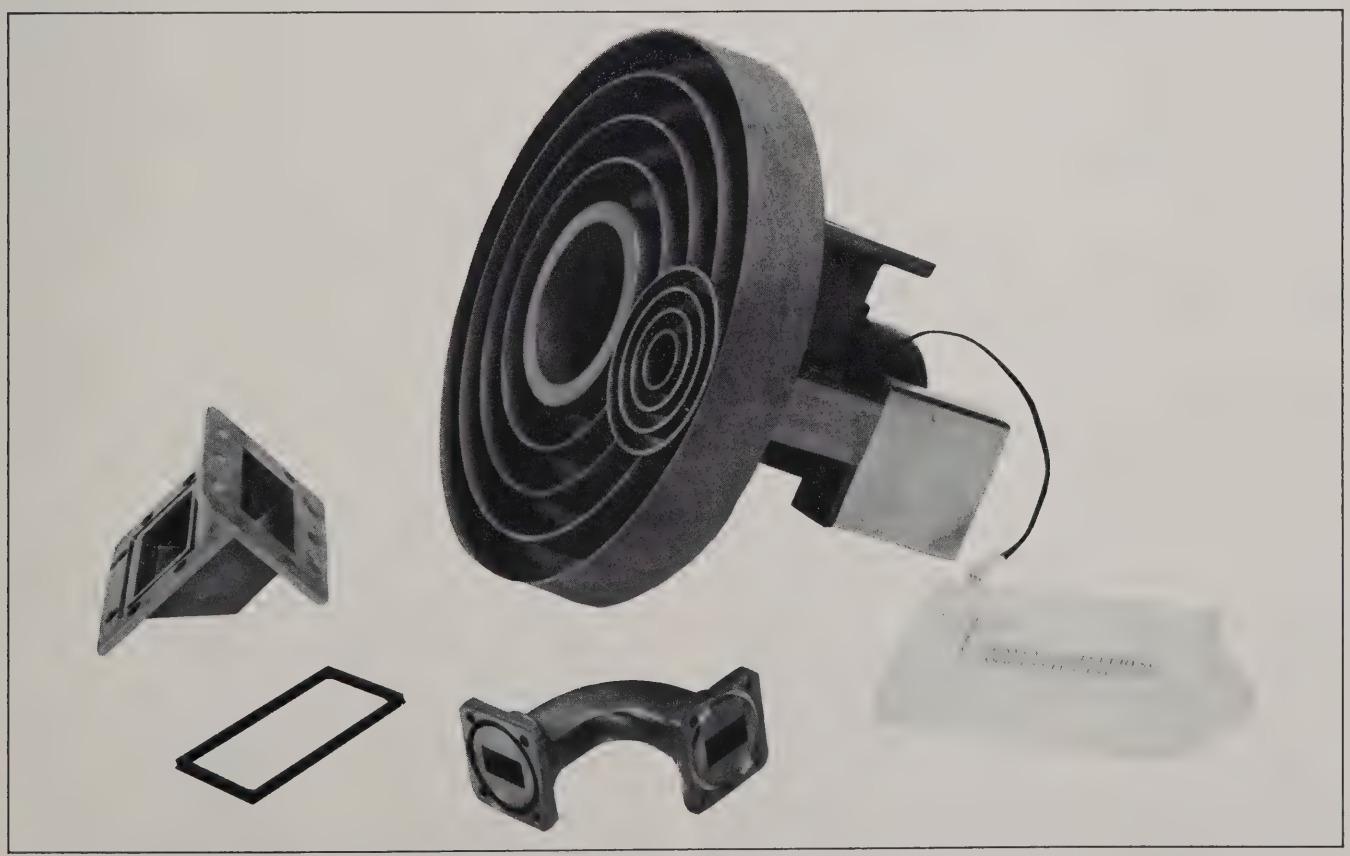


Table I
GAIN LOSSES DUE TO RANDOM REFLECTOR SURFACE ERRORS at 23GHz

Peak-to-peak Surface Error, inches	Gain Loss dB
0	0
1/16"	0.6
1/8"	1.1
1/4"	4.6
3/8"	10.4



The Seavey Ku-band Feed Retrofit Kit.

In practice, the gain of an existing antenna will be degraded from:

reflector surface tolerance,
reflector mesh transparency,
feed misfocusing,
reflector mount pointing accuracy,
ice on antenna,
rain.

Table I gives the effect on antenna gain from surface errors. Note that even small surface errors can give rise to very large gain losses at 12 GHz. To estimate the size of dish errors requires two numbers: random errors and major dish distortions. Random errors can be inspected by estimating the peak-to-peak ripple of the reflecting surface. Major distortions can be difficult to determine visually, but can show up, for example, by sighting along the reflector periphery to judge any warping of the structure. A more accurate estimate can be made from a masonite or cardboard template set onto the dish surface. This trick requires a knowledge of the reflector's focal length and some assistance. In general, as can be seen from Table I, if the peak-to-peak surface error attains more than about ⅜ inch over most of the surface, the gain losses will become too large for reliable operation at Ku-band.

Some reflectors may have good tolerances for the inner portion of the reflector and poorer tolerances for the outer sections. Bearing in mind that the equivalent dish size required at Ku-band is only about 40 percent or so of the aperture required at C-band, this effect may indicate potential good results even though the overall surface error is larger than desired.

Some reflectors are manufactured so that adjustments to the surface shape can be done by the user. If so, the antenna should be adjusted according to the manufacturer's instructions.

Another source of worry is the size of any antenna surface openings. In general, Ku-band antennas should be solid surfaced with metal or metal equivalents such as Transmet or Rhomoglas metallized glass fibers. These materials do not permit significant losses from leakage of signals through the surface.

Mesh materials do leak signals and therefore cause gain losses. Table II shows some typical data for common meshes. As the Table shows, if the mesh or perforated material opening exceeds about ¼ inch, the gain losses become excessive. Refacing the antenna with smaller opening materials could help in this instance, even if it were done only over the center portion of the dish; care should be taken to assure that the parabolic contour is adhered to, however.

Table II
GAINS LOSSES DUE TO MESH LOSSES ON RELFECTORS
at 12 GHz

Mesh or Perforated Sheet Opening, inches	Gain Loss dB
solid	0
1/8 holes on 3/16 ctrs.	0.05
1/4 holes on 5/16 ctrs.	0.7
1/4 expanded mesh	1.5
3/16 flyscreen	1.5

Table III
GAIN LOSSES DUE TO FEED FOCUSING
at 12GHz

Difference of Feed focus from theoretical, inches	Gain Loss dB
0	0
0.15"	0.1
0.2"	0.2
0.25"	0.5
0.27"	1.0
0.35"	3.0

At Ku-band, the feed must be aligned more accurately than at C-band. There are two factors which apply here. First, the in-and-out focus results in gain losses from misadjustment as shown in Table III. Note that the losses start to increase rapidly as soon as the misalignment exceeds about ±0.25 inches.

The other factor is the motion of the feed boom or strut. If this strut permits the feed to move with respect to the reflector due to (for example) wind and ice loads, Table IV shows how this can deflect the beam and mispoint the antenna with respect to the satellite. Because the beamwidth of a well-made and accurately assembled antenna is about three times narrower at Ku-band than at C-band, even a small mispointing can cause large gain losses. In a practical case, the feed boom might be adjusted for better rigidity or light guy wires added to stabilize it.

This then brings up the subject of the stability of the entire antenna and mount. Deflections due to wind cause the same type of gain losses as those arising from feed strut motion. Table V shows these losses for various deflections of the edge of our typical eight-foot reflector. Note that even small edge deflections cause large gain losses. Some reflectors are made so that the center of the antenna is relatively rigid with the outer sections more flexible. In this case, Table V would give a pessimistic picture of the antenna's capabilities.

Rain causes much larger gain losses at 12 GHz; at times rain clouds can virtually wipe out marginal signals. A 3 dB gain margin may not be enough. With mesh antennas, undue expectations about Ku-band may not be realistic in very rainy weather.

Icing of the antenna structure can cause reflector mispointing through structural deflections; at Ku-band it also can cause the antenna beam to be mispointed if ice builds up on the lower surface of the antenna. This effect occurs because the ice effectively makes the antenna into a new shape having its parabolic axis at an angle to the original axis.

In extremely bad situations, the reflector may have so large a surface error, or be warped so badly, or be mounted so flimsily that the antenna gain losses exceed 8 dB or more. In these cases, the antenna may not exhibit a real "main beam" and may have a radiation pattern containing several almost-equal beams at odd angles to each other and to the antenna axis. Reception of Ku-band sig-

nals may *still* be possible in these cases, although not reliably since the reflector could easily change shape or move from the satellite in the wind.

What is required is to judge each installation with an eye toward the factors just discussed, keeping in mind that total allowable gain losses approximating about 8 dB should be the worst case criteria.

As pessimistic as these discussions may appear, all is not lost.

Most TVRO antennas degrade gracefully at Ku-band because the needed antenna size is much smaller than the actual antenna diameter, and in many instances, the worst-case combination of all of the above effects does not take place at once. In addition, the Ku-band transponders have high EIRPs, and there does not exist the kind of terrestrial interference environment at Ku-band as there does at C-band.

It may be that relatively small improvements in the C-band antenna will dramatically effect the Ku-band gain. For example, tightening all mount hardware for maximum mount rigidity should pay dividends at Ku-band.

In selecting a new antenna feed, you should decide what you wish from the TVRO system. Feeds are available for several choices of polarization characteristics. Refer to the box * which describes some of the standard Seavey feeds on the market.

The Model ESA-124 has fixed polarizations and coincident Ku- and C-band beams. That is, the antenna can be pointed to the satellite and receive C- and Ku-band signals *simultaneously*. There are presently in orbit and planned hybrid satellites which emit both downlink signals at the same time, many with cross-strapping capability in which the Ku-band uplink signal can be downlinked at 4 GHz. If simultaneous operation at Ku- and C-bands is desired, then two separate receivers should be employed together with the ESA-124 feed.

Many TVRO installations will not require simultaneous operation. In this case, the ESR-124 family of feeds should be selected. These consist of two feeds joined in one package. The 12 GHz feed is placed at the focal point and the C-band feed is aligned at right angles to the reflector mount's polar axis.

In this manner, the antenna causes two main beams to be formed; one on the reflector axis at Ku-band and the other (say) to the East at C-band and separated by about two degrees from the Ku-band beam. In use, the antenna is simply jogged the necessary two degrees to the East when operating at C-band. With many mount positioner controllers, the angular positions of the Ku- and C-band beams can be programmed in memory, as the satellite hour angles are, thus facilitating the switching of the system from Ku- to C-band operation. Of course, the A/B switch in Figure 1 must be selected properly together with the reflector motion described above. Figure 2 shows the Model ESR-124 feed.

Table V
GAIN LOSSES DUE TO EDGE DEFLECTION OF 8-FOOT ANTENNA
at 12 GHz

Edge Deflection in Wind or Ice inches	Gain Loss dB
0	0
0.1"	0.3
0.2"	1.3
0.3"	3.0
0.4"	5.3
0.5"	8.2

Table V
GAIN LOSSES DUE TO FEED STRUT DEFLECTION
at 12 GHz

Deflection of Feed Strut (at end) - inches	Gain Loss dB
0	0
0.1"	0.3
0.2"	1.0
0.3"	2.7
0.4"	5.0
0.5"	8.0

The Model ESR-124 also is available with other features such as dual polarization, fixed linear and four-state polarization switching. The latter (Model ESR-124C) is useful when receiving both European and domestic satellites; the Intelsat satellites require circular polarizations at C-band, and some European DBS satellites, such as ECS-1 are circularly polarized at Ku-band. The ESR-124 provides remote selection of vertical, horizontal, right-hand and left-hand circular polarizations at C-band and Ku-band.

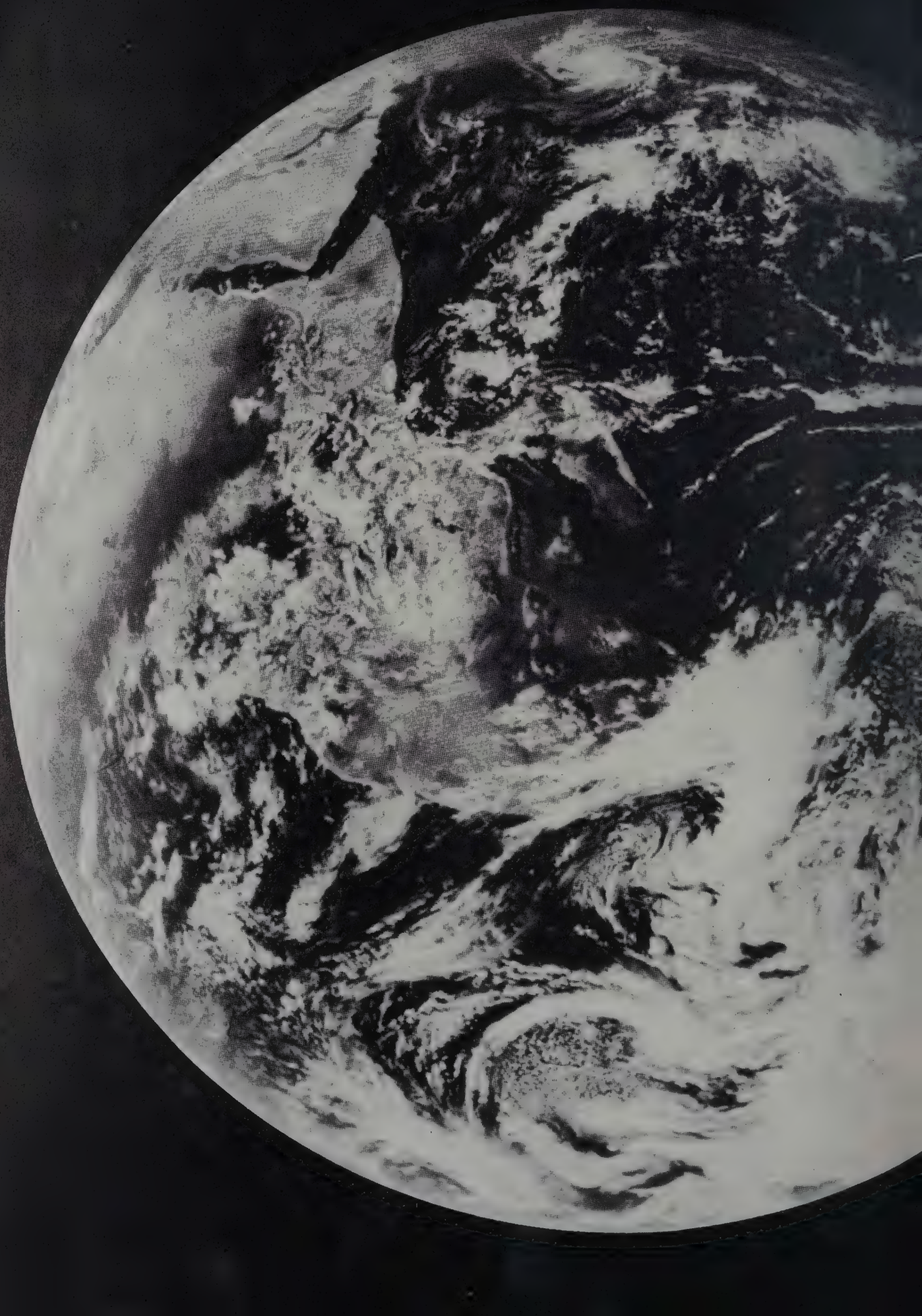
The newest version of this popular feed series is the Model ESR-124H, which provides separate control of polarization skew for both C-band and Ku-band with on-axis beams, thus eliminating the need to move the antenna when changing frequency bands. This product will be available shortly for general use.

All of these feeds use two separate servos for polarization control. In use, they are simply paralleled and connected to the servo terminals on the receiver. To install, observe manufacturer's instructions, mount them as described above and attach the LNC's, wiring the servo motors to the receiver. Then, after checking focal alignment and, if necessary, stiffening up the feed boom and mount, reception of all transponders should be possible within the limitations of the antenna.

Some users may wish to operate only with Ku-band. Retrofit modification kits are available from Seavey for this purpose. Figure 3 shows one of them (for example for the Harris Delta Gain antenna series). They consist of a Ku-band feed designed to mount within the circular aperture of the C-band feed, eliminating C-band operation.

With relatively little modification of standard TVRO equipment, you can begin to take advantage of expanded programming available at Ku-band. Soon the number of Ku-only and hybrid satellites is expected to exceed the C-band-only satellites. With this growth will come an explosion in communications services and programming for the future.

John Seavey is the president of Seavey Engineering Associates, Inc., Cohasset, Mass. His company specializes in antenna development and testing, and offers a wide range of antenna feeds for the TVRO enthusiast.



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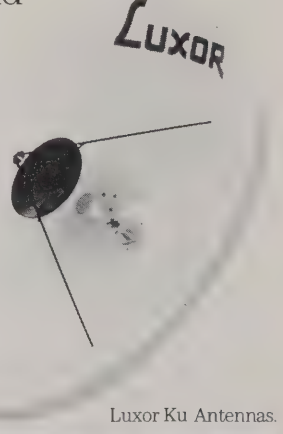

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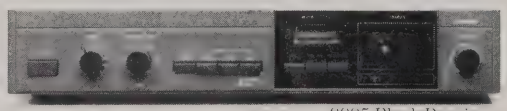

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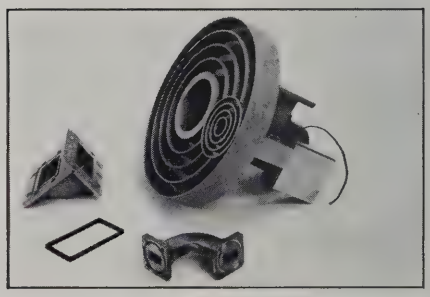
Dan Wynne Puts Together His Own Ku-band System

by John Brannon



Wynne experimented with a DX system, a Seavey feed and a Raydx Mesh antenna to form his own Ku-band system.

A Florida TVRO dealer-turned-distributor who has put together a C- and Ku-bands system said he's learned the mesh-versus-solid controversy may be a lot of hype, and that actuator manufacturers will have to produce a more accurate product if they want a piece of the Ku-band market.

Dan Wynne, former owner of Florida Satellite, Inc., a Lake Park-based chain of TVRO stores, recently established a Ku- and C-band products distributorship, Wynne Satellite Supply. His retail TVRO business, founded in 1980, grew by leaps and bounds. Last year F.S.I. grossed about $1 million in retail sales.

The decision to move from retail to wholesale came as a result of Wynne's disappointment with the Nashville STTI/SPACE show. While there, he contacted distributors and manufacturers about Ku-band products. He didn't get much help. So, he went home, pieced together his own Ku-band system, did some soul-searching, and sold the retail business to his brother-in-law, Ashley Adams.

"I came back from the Nashville show very disappointed," Wynne said. "I was thinking that, with the way the industry changes, the distributors and manufacturers would be on the ball. They weren't. We live in South Florida, and the Miami Dolphins are a very hot item here. With NBC switching over to Ku-

band, we had a lot of customers who were concerned. They had already purchased (C-band) systems and wanted to upgrade them."

Wynne said he experimented with a DX system, a Seavey feed, and a Raydx 10½-foot mesh antenna. "We heard a lot of, 'The holes are too big in mesh for Ku-band.' We heard all that and decided to see if the theory is true."

There was no instantaneous picture, he said, and it took some work to get one. Six hours.

"We were very shocked to be able to adapt the feed that we wanted to use, and work with a linear drive that we were told would not operate at Ku and C correctly," Wynne said. "A lot of people said the Raydx dish would not work at Ku-band. As our package, we experimented with the Raydx dish, Seavey feed, DX LNB and receiver, DX actuator and Hammerblow drive, and Norsat LNA for the C-band.

"My whole point was I wanted a combination system that worked. I don't want to sell two dishes (a Ku-band and C-band) to anybody and I don't think a dealer has to go back to a customer and say, 'You've got to buy another dish to Ku-band.' "

Satisfied with his package, Wynne took it to the Orlando show at Orange County Civic Center last October. "We were the only ones there with a Ku-band system. We showed pictures off SBS3 satellite, and were the talk of the show. We used a Seavey feed and showed how easy it is to watch both Ku- and C-bands. That's what got all the attraction. We used a standard AB switch to switch back and forth."

For actuators that would work ideally with his system, Wynne tried several, and at one time thought that a horizon-to-horizon type mount "with little slop" would be the only one that worked.

"The linear thing is important," Wynne said. "Ku-band is so tight, not like C-band where you can wave an antenna out there, get your receiver on scan, and you've got a picture, and then tweek it in. With Ku, you're either on it or off it. There's no room for error. It's very tight."

Is There Really A Ku-band Market?

For those who doubt there is a Ku-band market developing, a quick check of future satellite launches offers a convincing picture of skyrocketing opportunities.

Currently there are four satellites offering both C-band and Ku-band services, and seven additional Ku-band satellites. C-band satellites number 25 serving the Western world.

The picture is changing, however.

Of the scheduled launches through 1990—just five years—17 satellites will be C-band and more than 75 will be Ku-band with a dozen or so additional satellites providing both Ku-band and C-band services.

The market is largely tied to business and business services now with growing numbers of television services switching or adding Ku-band. NBC feeds and programming are on SBS-3 and both ABC and CBS will soon offer Ku-service. Two Canadian satellites, Anik C2 at 105 degrees and Anik C3 at 117.5 degrees offer a number of programs ranging from movies and sports to pay TV.

The future includes marketing opportunities for both home and business in the developing Ku-band market.

Ku-BAND VIDEO CHANNELS

TR NO.	TR FREQ.	POL.	DSB-600/700 CH. NO.	SERVICE
SBS 3				
TR-1	(11.725)	H	1	Occasional video
TR-2	(11.774)	H	4	VIDEOSTAR CONNECTIONS (6.8)
TR-3	(11.823)	H	6	NBC - West Feed (6.2)
TR-4	(11.872)	H	9	Occasional Video
TR-5	(11.921)	H	11	NBC (6.2)
TR-6	(11.970)	H	13	NBC - Central Feed (6.2/6.8)
TR-7	(12.019)	H	16	CONUS/HUBCOM (6.2/6.8) CAMPUS NETWORK (6.8)
TR-8	(12.068)	H	18	PSN (Private Satellite Network)
TR-9	(12.117)	H	21	NBC (6.2/6.8)
GSTAR 1				
TR-15	(12.110)	V	20	Occasional Video (6.2/6.8)
TR-16	(12.171)	V	24	BONNEVILLE TELECOMMUNICATIONS
ANIK-C3 East Beam				
TR-1A	(11.730)	H	1	Atlantic Satellite Network (5.41)
TR-2A	(11.791)	H	5	Premier Choix/TVEC (French) (5.41)
TR-4B	(11.939)	H	12	La Sette (French) (5.41)
TR-5B	(12.000)	H	15	TB Ontario (5.41)
TR-8A	(12.157)	H	23	First Choice (5.41)
TR-8B	(12.183)	H	24	Radio Quebec (5.41)
ANIK-C3 West Beam				
TR-4B	(11.926)	V	11	Knowledge Network (5.41)
TR-5A	(11.961)	V	13	Access Alberta (5.41)
TR-5B	(11.987)	V	14	Premier Choix (French) (5.41)
TR-6B	(12.048)	V	17	First Choice (5.41)

Will Mesh Work For Ku-band?

Taylor Howard Says . . .

Are you worried whether your mesh antenna will work at Ku-band?

Don't sweat it, said Taylor Howard of Chaparral Communications.

And if you've got a 24-transponder receiver with microprocessor controlled detente tuning, it can easily be made into a 32-channel receiver for Ku-band reception.

"I just finished testing a mesh dish that worked very, very well at Ku-band," Howard said. "In fact, every mesh dish I've tested has worked well at Ku-band."

He noted, however, that mesh antennas with petals in them perform okay now at Ku-band, but their sidelobes are poor because of the flat petals. "They have good gain, but their sidelobes are fairly high," he said.

"In the future they won't perform as well because their sidelobes will be there, and we'll have adjacent satellite interference. But right now there aren't any adjacent satellites, so it doesn't make any difference. But as far as the gain, they have the gain, particularly if you get a 10-foot antenna that may be only 30 or 40 percent efficient, but that's plenty of gain for Ku-band."

Howard said there's a way to meet the receiver problem head-on without having to lay out cold cash for a new receiver. Ku-band satellites may have as many as 36 transponders, and satellite TV consumers are mainly equipped with the standard C-band receivers with only 24 channels.

"Modern receivers have detentes, or channel numbers, on them and their channeling is controlled by a microprocessor, controlled by software, not by hardware," Howard said. "There is no standard on the channeling for Ku-band yet. There are some 32-transponder Ku-band satellites. If you look at the Hughes plan, it's for 16-transponder satellites, and they put two in

"I just finished testing a mesh dish that worked very, very well at Ku-band . . . in fact, every mesh antenna I've tested has worked well at Ku-band."

—Taylor Howard

Mike Olivetti Says . . .

The rapid development of consumer interest in Ku-band satellite TV is causing consumers, dealers and distributors alike to ask, "Will my mesh antenna work?"

It's a good question. In the balance may hang thousands of dollars in retooling of current antennas, and new sales for replacement antennas that cannot be converted to perform acceptably as Ku-band reflectors.

Well designed solid antennas—fiberglass, steel or aluminum—will work for Ku-band. But mesh antenna efficiency depends on the diameter of the holes in its surface. If the holes are too large, the TV picture will be adversely affected.

"Holes should not be larger than 1/10th inch in diameter," said Mike Olivetti, chief technician, DX Antennas. "At the Ku-band frequency, mesh antennas with holes larger than 1/10th inch will cause a distorted picture."

Other than the mesh-solid issue, the matter of antenna size must be considered. "The picture quality off a large antenna is not as good as it is off a small one at Ku-band," he said. "A four-foot antenna is about the norm."

Some DX Ku-band support products are the DX850 mounting bracket, which mounts the LNB and polarotor onto the antenna. "Also, you'll need a 504-2C LNB, 12 GHz, and either a 600A, 700A or 700S DX receiver, all of which are Ku-compatible."

NBC uses a DX 1.2-meter antenna and DX tri-pod mount for mobile operations. "With the tri-pod mount, the antenna can be moved anywhere," Olivetti said.

DX's four-foot antenna system for Ku-band includes a feedhorn, LNB and mount assembly. "It's full assembly, a very simple hook-up, probably easier than C-band," Olivetti said.

Howard *Continued*

the same place, so you get apparently 32 channels as far as the consumer is concerned. Sixteen- and 32 is probably going to be standard, like 12- and 24 is the standard for C-band.

"You just want to make sure you're buying a modern receiver that's controlled by a microprocessor. And it can be reprogrammed in the field by the dealer. Chaparral has a little box that the distributor can loan the dealer or the dealer can get, that goes in the back of the receiver and just puts in a new software load, puts the channeling in for whatever satellites people want to watch."

Howard doesn't call it widened-channel capability, but "more channels in the same space, so the quick-stops on the knob are different on the old-type receiver. But on a modern receiver, the quick-stops are controlled by the computer."

Times change and by the time we get used to doing things one way, somebody up and changes the rules. Where we have been comfortable with C-band satellites and horizontal-vertical polarity, now comes Ku-band satellites and . . .

"It looks to me, from knowing what RCA, Hughes and GE have done in the past, that Ku-band, when you specify the satellite, you'll have to specify the channeling format," Howard said. "Not only the polarization format, but channel spacing. The key to it is, these new receivers, like our Sierra, and some others that have the software programmability, to go to different channel spacing and different channel widths for each different satellite."

Downconverters for Ku-band come in two breeds, the expensive and the less-expensive, Howard said. The expensive ones have about a 2½-dB noise figure, and the less expensive ones have about a 3- to 3.1-dB noise figure.

"For SBS3 (Ku-band satellite), you really need about a 6-foot dish and a 3-dB noise figure (downconverter) and you'll get just barely sparkle-free pictures," he said. "With Gstar, that's not good enough. Gstar's continental U.S. beam is not as strong as SBS3, so you need better quality; either an 8-foot dish or the 2½-dB noise figure type of downconverter. SBS3 is all horizontally polarized. Gstar is both polarizations, so you need to be able to select polarity. We have polarotors for Ku-band now that will do that."

"If I got two calls a week about Ku-band a year ago, it was a lot. Now it's an everyday occurrence. That's going to be the major trend five years from now."

—Mike Olivetti

Olivetti *Continued*

It's odd how times and interests change, he said, adding that a year ago, DX received few calls about Ku-band. "Now we get calls everyday on Ku-band; calls about combining C-band and Ku-band on one dish with our 850 bracket. It's really starting to take off.

"Also, the polarity is another thing people ask us about. A lot of the Ku-band transponders are only one polarity. But now, there's dual polarity on Ku-band transponders. Not many, and it's still in its infancy.

"If I got two calls a week about Ku-band a year ago, it was a lot. Now it's an everyday occurrence. That's going to be the major trend five years from now. All the major networks are transferring to Ku-band and more Ku satellites are going up. Our company, DX, is going to put up a 36-transponder Ku satellite in March 1986. That's the trend of the future—Ku-band."

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Two Band Operation With One Antenna

by Cliff Fleury

Home satellite reception of Ku-band television signals has been the focus of increasing interest in recent months. Retailers are currently demonstrating both C and Ku-bands for their prospective customers, and if they don't initially sell a dual band system, at least they install one that can easily be retrofitted for Ku-band at a later date.

Not all home satellite antennas are Ku-band compatible. Many only function at less than 25 percent efficiency. It will be very important to determine how well the antenna will perform, on both bands, prior to choosing a feed assembly for optimum performance. Ideally your antenna should provide a balanced signal level to the customer's band switch, making it impossible to visually determine which band they are viewing.

The choices currently available in feedhorn designs are: Ku-off axis feed piggy-backed on C-band scalar ring plates, C-band off axis feed one-half wavelength from focus point, and Ku-band off axis feed one wavelength from focus point. You should be able to shift these dual feeds around by utilizing adjustable mounting brackets. In any event, the correct combination of feed assembly and antenna must be determined to have satisfied customers.

At best a mix and match approach will be needed in order to obtain a reasonably well balanced carrier-to-noise ratio at the receiver. Because the wavelength is one-third as long as Ku-band, you can expect the beamwidth to be much sharper and therefore antenna navigation will be proportionally more critical. Deeper antennas in the .35 region will be more forgiving because of their broader beamwidth. Unfortunately, off axis feeds will not perform well on deep antennas.

Cosmetics have become very important in antenna design. Some "see through" style antennas may not provide optimum performance at the higher frequencies. "Radar mesh" will work, provided it is positioned to enhance signal departure and off axis feed considerations.

With two band operation on one antenna everything becomes a compromise at best. It is obvious you may get by with Ku-band center/C-band off axis arrangement on a 12-foot mesh antenna with a .375 F/D but not by reversing the two feeds. Conversely on an 8-foot or 9-foot antenna of spun, fine perforation, or properly positioned mesh, C-band center/Ku-band off axis might be a better choice.

Cliff Fleury and Dimitri Kalemkaeris, vice president and co-owner of Cosmos Satellite Antenna, Mfg., Inc.

The signal strength degrades dramatically as the feed is moved off axis by more than 1.5 degrees, by more than 1 wavelength, and by ratios deeper than .35 F/D. Very high antenna gain will be required whenever a feed is off set beyond 1 wavelength. A wavelength is 8.11 cm or 3.7 GHz and only 2.5 cm at the lower edge of Ku-band.

Very good results can be obtained by placing the Ku-scalar feed within the R.F. choke plate of a typical C-band scalar feed assembly. Compromising the field balance on the 4 GHz unit has not been a problem. An adjustment scalar plate is preferred because azmuth alignment for polar tracking is easier as well as the obvious benefit of independent polarity adjustment. See figure 1.

Mount stability and actuator accuracy will be three times more demanding. Many customers may need to fine tune antenna positioners more often. Antenna feed brackets must be strong and stable enough to accomodate the additional weight of the two feeds and their accompanying LNB's without any movement relative to antenna position.

These tips may save you time in the field and offer new market areas to pursue, namely updating the existing home satellite customers for two band operation.

Cliff Fleury is marketing director of Cosmos Satellite Antenna Manufacturing, Inc.

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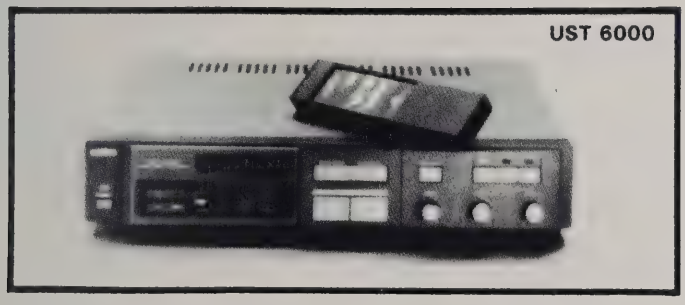

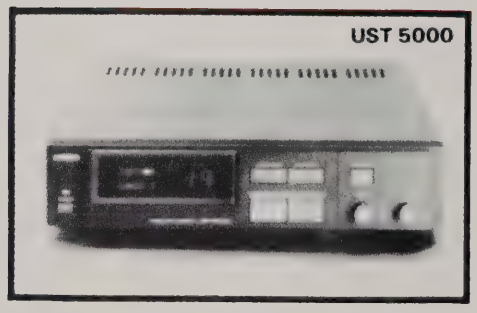

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World of Opportunity

Continued from page 19

much interested in the Ku-band TVRO market. We're much more interested in commercial applications of the Ku-band. We have produced a wide variety of small-diameter earth station antennas for this use, ranging from less than three-quarter meter diameter to 2.4 meters. We think the marketplace is going to have explosive growth beyond anything that we have experienced yet with the C-band market."

Richard McKelvey, vice president for engineering, HyTek, said the bulk of the Ku-band market lies in the business applications field, but more and more programming for home entertainment will develop.

"When that happens, the consumer market will open up," McKelvey said. "Our receiver, the 500 model, is compatible with the Ku-band, at the proper frequency, offset, and it will have a programmable IF input for a 12-GHz downconverter on the back so you don't have to flip any switches to go from C-band to Ku-band. The way we plan on doing it is to have a little piggyback Ku-band feed and downconverter that'll attach next to the C-band scaler. Of course, the dish has to be off boresight slightly for the Ku-band reception, but that would just be another position programmed into the memory of the receiver, and wouldn't be anything special as far as its operation goes to the end user."

"Any new product we're bringing out right now, we're trying to insure it is compatible with Ku-band, but we haven't tried to make any real push for Ku at this point."

A number of other traditional TVRO manufacturers are actively designing and producing Ku-band products—Uniden, Panasonic, Norsat, and Winegard, to name a few.

Canadian telecommunications firms are also actively producing Ku-band products. Gary Carter, products manager, General Instrument Corp., Toronto, said GI created a series of Ku-band equipment for a company no longer in business. The receiver was originally designed and intended to be used by various DBS operators. It's an infrared control receiver with volume control.

"Similarly, we have developed a fully addressable scrambling system meant to be used by a DBS operator. The descrambler interfaced with the SRX102 receiver, giving a completely addressable home DBS terminal.

"Going into the future, we have put that plan into various teleconferencing concerns, one being Com-Sat General. We are addressing the whole marketplace, looking to find a customer."

Carter said GI's encryption system, StarLok, comes in several models, and has applications to both business and entertainment functions. "Some people who use the system now are educational customers who offer continuing education courses via satellite, and video-conferencing customers like the American Law Institute, American Bar Institute, and U.S. Government agencies."

Ku-band telecommunications activity, he said, "is going to explode.

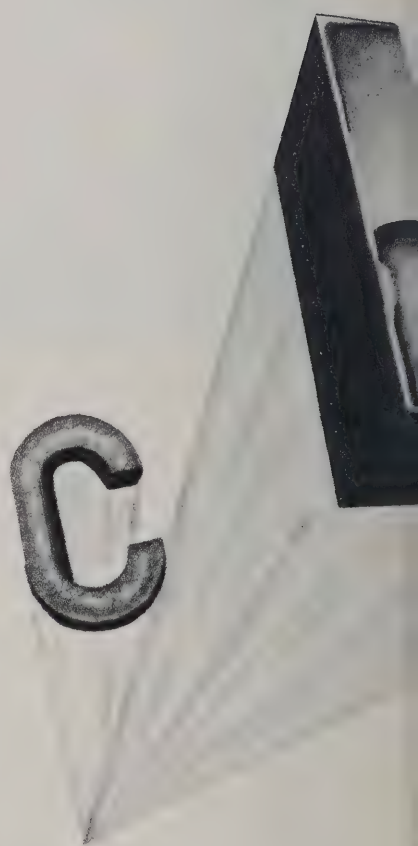
"Programmers who make the effort and spend all the money to go to Ku-band will scramble right off the bat. Many who are there today will scramble shortly. I really doubt there'll be a Ku-band backyard business the same as there's a C-band backyard business now.

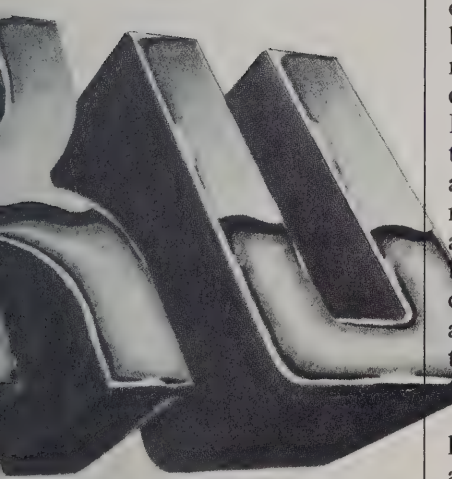
"Ku-band is preferred by many of the business applications because the antennas are smaller, but also because you can go into cities with relatively small antennas and absolutely no terrestial interference."

Carter said GI is marketing its Ku-band systems in both Canada and the U.S. "There are a few others, but we think we are one of the leaders in that business, when you construe the business to be small-aperture Ku-band terminal. For the marketplace, we currently offer a 1.2-meter antenna on a polar mount. It does not have an automatic actuator. It's a manual system.

"You are aware that Chaparral and Seavey have attachments available that go on a standard C-band feedhorn to give the average homeowner a combined C- and Ku-band system. Dual feed. Well, in time GI will be in that business. It's important to us in the business development and we can't reveal what we are doing in that area. We have publicly told some other people that we are developing a C-band/Ku-band hybrid receiver that will be available within six months."

Peter van der Gracht, president, Nexus Engineering, Burnby, B.C., said, "We're certainly very excited about Ku-band, not just for the entertainment market, but also for the two-way business market, because





it doesn't have the problems with terrestial interference and uses small dishes. As far as products our company manufactures, we have a block-input satellite receiver, which is Ku-band compatible.

"I think the same kind of things are going to happen in the business market that happened in the entertainment market. The satellites have really changed some of the economics about how it makes sense to move information around. In the old days, it used to cost a cable company tens of thousands of dollars to microwave signals, and as a result, there weren't a lot of them around, and they weren't making much money. The satellite market changed all that and opened up a whole bunch of opportunities. The same thing is going to be the case for business—all kinds of communications between headquarters and its dealers and amongst dealers themselves. I'm talking about distributing communications. Right now, they rent landlines from a telephone company. It's much more economical to use a satellite link. Lots of applications like that, starting with the big business with the most extensive communications, and as the technology improves and the prices come down, moving toward the smaller businesses that can then afford lower-cost equipment.

"I think entertainment TV is going to lead the way. It's going to be the first application, and push manufacturers like ourselves to develop low-cost hardware for that market, and then once that develops, the opportunities are there for the business users as well.

"As far as Ku-band goes in general, it's much nicer to use than C-band. It is a whole new market. The business side of it is going to open up a lot of opportunities to a lot of manufacturers. That's been one of the differences between C-band and Ku-band. Because C-band has been subject to TI, it hasn't really been deluxe for companies to use in a two-way sense."

Charlie Pitts, president, Vexus Telecommunications, Inc., Toronto, agrees with van der Gracht in his market assessment.

"Our position is that the DBS market is up and coming," Pitts said. "It will run parallel to the C-band industry. By the end of the decade we'll see operating good, solid DBS satellites with programming. We're working right now on a project for northern Canada that will place, within the next three to five years, about 10,000 of these DBS systems for not only regular television, but also communications transmission, information sharing and data. With the cost of ground stations, we believe the Ku-band market is quite viable. It's not here yet, except more or less in an experimental mode.

"All our antennas and major lines that we produce are all DBS-addressable. They were designed that way. We put antennas with both transmit and receive capability."

"It helps for an actuator to be very agile," said Chaparral's Mark Sheldon, "a high degree of actuator accuracy and ability to make finite movements. All of them out there work to a degree. But what I'm saying is that's going to become more and more of an issue. The Ku-band is much narrower frequency than the C-band, thus an actuator has to have the ability to make finite movements. More precise actuators are in the future."

Phillip Shou, president, Pro Brand International, Inc., Lexington, S.C., said he may have one of the only actuators appropriate for Ku-band. It is an 18-inch, 10-turn, 10K 'pot' with a built-in limit switch. Another PBI actuator is the Z500, a fully-programmable controller, with a new software and interface box, which enables the unit to work with Panasonic C2000 and Drake 424 receivers.

Roof mounts for smaller antennas may be increasingly demanded as Ku-band home entertainment and business television applications proliferate. One such manufacturer is Rohn Products, Peoria, Ill., producing mounting systems, universal roof mounts, saw-horse roof mounts, and others. "Rohn's engineering staff has done exhaustive research and development to perfect each mount to serve a specific purpose," said Chuck Tabacchi, advertising manager.

Whoever opened the gate to Ku-band territory may not have realized the opportunities available to both the C-band traditional TVRO and business television markets. But the exodus is underway, "and that's not all bad," said Taylor Howard, of Chaparral Communications.

"I think it's good for us and it's the future. The long-laid plans of the DBS planners will come to fruition by the end of this century. We'll move to Ku-band slowly, and it'll be an orderly transition."

Testing Dual-Band Systems

by Gus Grevemberg

A dual Ku-/C-bands system means the reflector should be designed so that the majority of both 4- and 12-GHz signals are reflected to the feedhorn.

In the past few weeks we purchased several thousand dollars worth of Ku-band "compatible" equipment for testing purposes. We bought reflectors that claimed Ku-band compatibility. Some of them worked, some didn't. None really worked very well.

None of the systems tested had mounts or feeds and feed support equipment accurate enough for good Ku- and C-bands dual reception.

Mounts demonstrated too much play and the feed support systems just were not strong enough to maintain the accuracy required. When mounting a dual system, you're adding a couple of pounds of additional weight that most feed support systems are not designed to handle.

The mount for the reflector should be designed so that it doesn't have any slack or free play in any direction. This is particularly important on dual systems using large reflectors where the beam width will be very small.

The accuracy of the feed support system is even more critical to the top performing antenna. The feed assembly must be designed so that the circular waveguide points at the exact center of the reflector for dual Ku/C-bands systems to track every satellite. If you look at the noise figure on Ku-band LNBs, you may be surprised to find most at 2.5dB and some I have checked are higher—200 degrees K to 400 degrees K.

Gus Grevemberg is Vice President, Technical Research and Development, at Opportunities Publishing, Inc. He is a widely known instructor of TVRO technology and founder of the Satellite Opportunities TVRO School.

Another area of concern in my testing is in the dual feedhorn. The ideal system obviously should be centered over the reflector and have provisions for both the Ku- and C-bands LNB or LNA in a single unit. The offset feeds currently available are more practical with larger reflectors. I'm certain we will see design improvements which will place the Ku- and C-bands waveguides equally centered for maximum antenna gain.

Generally, the rapidly developing home market for Ku provides both good news and bad news.

The good news is Ku will dramatically expand and provide a new market. Smaller antennas made possible by the higher power of Ku satellites will mean fewer restrictions from zoning codes.

The bad news is we have a long way to go in the development of Ku technology, but even here there is good news. The pioneers of the home entertainment industry will recall that the early days of TVRO were experimental. Products were developed that worked, but did not work well. Industry designers, however, quickly answered each problem, and the resolution of these problems in system design and manufacturing gave birth to a C-band market that will be billions of dollars strong in the years ahead.

The precision required for dual Ku and C-band reception will force manufacturers of reflectors, feeds and feed support equipment to build much better products than those we have used for C-band. I am confident they will respond and we and our consumers all will profit.

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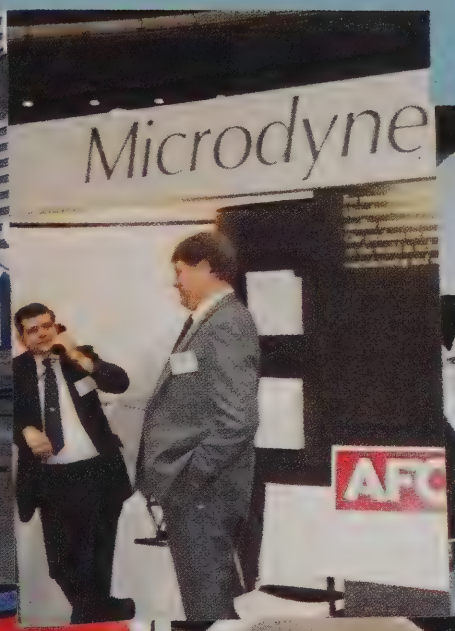
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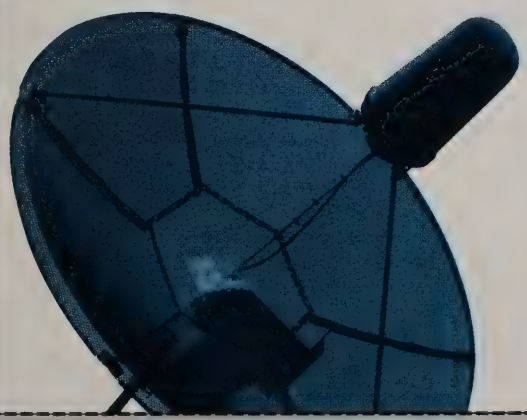

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Luxor's 9900 Receiver A Trend Setter For TVRO

Luxor North America Corp., has a view of TVRO's future, and it clearly focuses on both C-band and Ku-band home entertainment.

You can see their vision in the Luxor 9900 Block satellite receiver that answers most of the questions of home satellite entertainment . . . now and in the future.

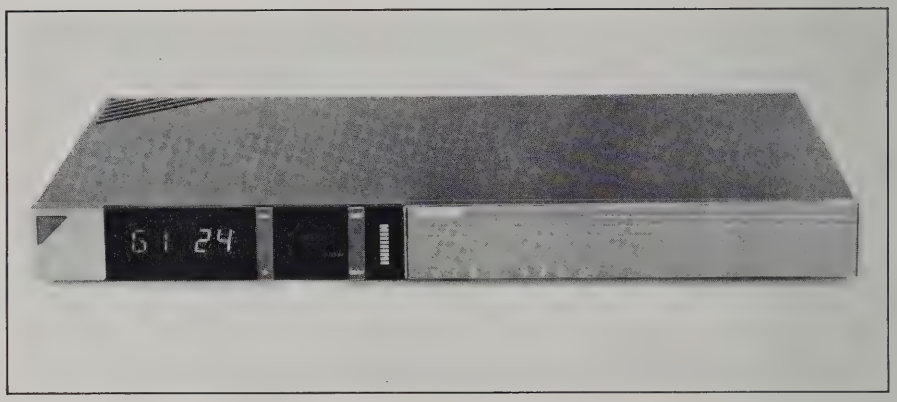
The system has factory programmed 35 satellite locations and 840 channels in a component system which includes the master unit (the 9900) and lower-cost slave unit (the 9995) which can also operate as a stand along Ku/C-band receiver. The 9900 is completely remote controlled from any room in the house, and the full unit even includes stereo loudspeakers in passive or active models.

Hans Giner, Luxor's president, calls the 9900 the trend setter for the TVRO industry. He may be exactly on target.

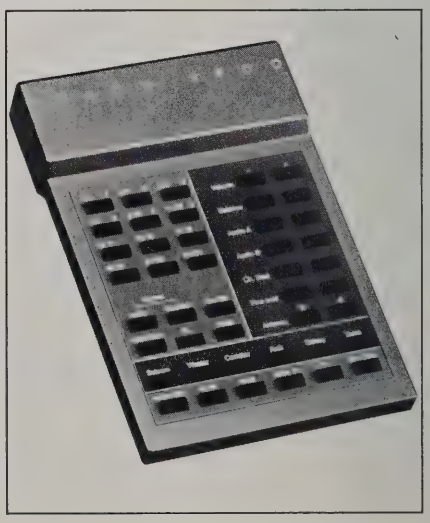
Giner said that while the 9900 system offers features designed to satisfy videophiles and audiophiles, it is simple to operate. All functions are controlled by push button from the hand held wireless remote control unit. In addition to being user-friendly, the 9900 has a built-in self diagnostic system, for ease of technical maintenance by dealers.

Fully integrated, the 9900 Block receiver has a built-in antenna controller. Through its hand held remote control, the 9900 commands a three-speed actuator which precisely locates satellites and fine tunes antenna position for optimum channel reception of both video and audio signals.

The hand held remote control separates buttons for channel selection,



(Above) Luxor's 9900 Ku/C receiver with (right) remote control.



tuning, and switching functions into logical color coded groupings. Video and audio delivery are automatic for most viewing.

The 9900 receiver has five audio modes, factory programmed to each transponder for automatic delivery of the proper sound system when a channel is selected. These include two monaural modes, two matrix, discrete stereo, and automatic multiplex selection. Any other audio subcarriers can be tuned in for audio-only hi-fi listening, in addition to TV viewing. Other audio functions include remote Dolby™ on/off, audio subcarrier frequency read-out, wide/narrow bandwidth selection, remote audio volume control, remote stereo balance control, built-in stereo processor, and direct loudspeaker drive.

The 9900 has a built-in A/B switch, polarotor drive, RF modulator, non-volatile memory unaffected by power outages, and a remote sensor interface. A "normal" button on the remote returns the system to factory pre-set values. While present satellite/channel locations are factory programmed into the 9900, additional transponders are easily added to the system memory.

The system also incorporates a Luxor exclusive called the Luxor Micro Step™ Tuning System (LMS), which automatically seeks the right signal within a given channel frequency and automatically compensates for frequency drift due to climate or transponder variances.

Using the remote, an internal TI filter can be assigned to individual channels to minimize terrestrial interference.

Similar to the Luxor 9536 used with the Luxor 9500 family receivers, the Model 9936 Remote is an auxiliary infrared remote control receiver. It is packaged with an additional Model 9901 hand held remote control. This inexpensive accessory permits independent control of a Model 9900 satellite receiver located in another room of a house or building for independent viewing.

The 9904 Actuator Interface, on command from the 9900's built-in antenna controller, provides a 35 volt power supply to the drive and actuator arm which moves the antenna as it tracks satellites. It is surge and voltage spike protected. Design coordinated with the 9900, the 9904 can be wall-mounted out of sight.

Luxor is also marketing high-quality microwave front end products as part of the 9900 system. Luxor's 9755 block downconverter and 9726 Low Noise Block Downconverter (LNB) are designed and built for continuous reliable performance.

The Block Downconverter (30 dB gain minimum) is used in conjunction with an LNA. The LNB (60 dB gain minimum) combines a low noise amplifier and a block downconverter in a single compact unit. Each unit is weather tight, rust-proof, factory inspected and tested against all design specifications, and fully warranted.

NASA Is Looking For Good Ideas

NASA is looking for experimentors to advance the technology of a new generation of satellites.

If you've got an idea, NASA will listen, and may test your concept as part of the Advanced Communications Technology Satellite (ACTS) Program. NASA is seeking organizations which are interested in conducting experiments on a launch scheduled for 1989.

"The whole point of ACTS, of course, is to advance the technology so that the next generation of operational systems deployed in the 1990s can accomodate the increase in the development of new services and markets," explains Deborah Gilman, ACTS Development Specialist of the Public Service Satellite Consortium.

The ACTS satellite has increased dynamic bandwidth capacity as well as flexibility of circuit level switching (in increments from 56KBPS on up) which allows for the bypass of terrestrial switching networks.

NASA is encouraging user experimentation with new and innovative applications for advanced communications technologies as well as traditional engineering and technical validation of these technologies.

The ACTS satellite can provide these services because it has several unique features not found on other domestic communications satellites. The satellite operates with both fixed and scanning spot beams and has on-board switching and signal processing capability at the circuit level. With the spacecraft spot beam technology, this allows for frequency reuse, a much more efficient utilization of both satellite and spectrum capabilities. The satellite operates in the 30/20 GHz frequency range of Ka-band. The technology, however, is readily adaptable to the Ku-band frequency range (14/12 GHz).

Interested groups should submit a one page letter of the proposed experiment to: Mr. Gary Zarlengo, ACTS Program Manager, Communications Division, NASA, Code EC-4, Washington, D. C. 20546. Additional information can be obtained by phoning Ms. Debra Gilman at 202-863-0890.

New Profits For Dealers

As the home entertainment and small business market for Ku-band services matures, C-band satellite dealers are likely to be in a good position to capitalize on these new profit opportunities.

At least that's the view of Jack Hanna, technical director of National Satellite Communications.

The developing Ku market recalls to Hanna's memory the early days of C-band TVRO when backyard entrepreneurs were seen as flight-by-night opportunists. But when C-band TVRO became a billion dollar market, big business took a second look and assumed a different attitude toward TVRO.

"With our technology (C-band) and the way it's moved along, we've got an organization out there with experienced people with regard to sales and installation. When the home entertainment market starts to move, the high tech manufacturers will begin to take notice. Dealers in the TVRO market will be in a very enviable position to build for themselves a good reputation in business in that community . . . they should be able to be on the cutting edge of these sorts of sales opportunities," Hanna said.

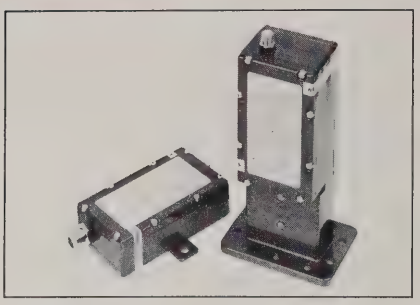
USFL And RCA Add Ku-band Programming

More indications of Ku-band programming were made recently when the United States Football League reached an agreement with RCA Communications for satellite syndication of its games in the 1986 fall season.

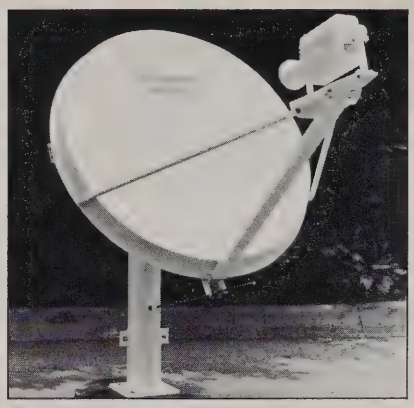
According to a story in The Commercial Appeal, Memphis, the system will require the USFL to sell games to individual stations across the country. Also, some games are expected to be carried by ESPN again.

The satellite to be used is the RCA Ku-band satellite that was launched in late November.

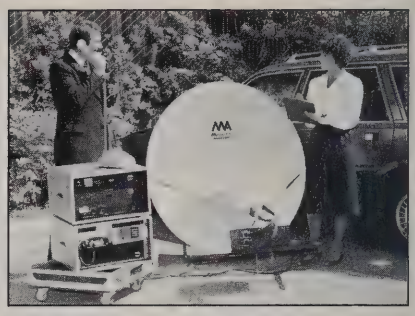
Technology Review



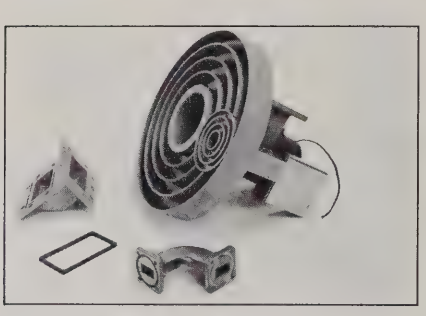
Luxor



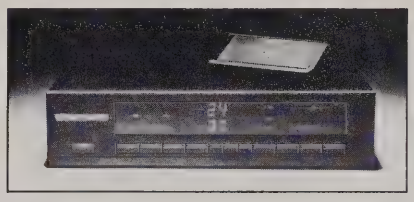
Scientific Atlanta



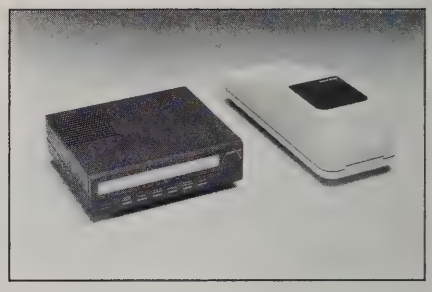
Modulation Associates



Seavey Engineering



Winegard



Omninet

Luxor's 9900 Downconverter

Luxor's 9755 (left) block down converter and 9726 LNB are offered as components in the new Luxor 9900 system which is both C-band and Ku-band capable. The system offers advanced features, including memory capacity for 35 satellites and 840 channel locations, built-in antenna controller and the new Luxor Micro Step Tuning System, which automatically compensates for channel frequency drift. For more information write Luxor North America Corp., 600 108th Ave., N.E., Ste. 539, Bellevue, WA 98004. Circle No. 104

C/Ku-Band Feed From Seavey

Seavey Engineering has announced a wide range of dual frequency C-band and Ku-band feeds which provide access to the total spectrum of satellite programming. All that is required is the addition of C-band and Ku-band downconverters to bring into the home the new sports and entertainment becoming available on Ku-band. Several different models are offered and have been field tested for more than two years. For more information write Seavey Engineering Associates, Inc., 135 King Street, Box 44, Cohasset, MA 02025. Circle No. 109

Scientific Atlanta's Business Terminal

Scientific-Atlanta's Business Terminal (SABT) combines the latest in Ku-band technology with high performance and cost effective electronics. The terminal consists of an outdoor electronics unit (OEU) with full 3 watts SSPA, an indoor electronics unit (IEU) and 1.2 or 1.8M antenna with single IFL cable. One of the unique features of SA's approach to private networks is the ease with which a system can be upgraded. For example, a private network could begin as a data receive only and later add video, or vice versa. The B-MAC security system can be added for maximum privacy and highest quality video, and with options for teletex and stereo. For more information write Scientific-Atlanta, Inc., 3845 Pleasantdale Rd., Atlanta, GA 30340. Circle No. 110

Winegard C/Ku-Band Unit

With the rapidly developing interest in Ku-band, consumers and dealers alike are asking for products that offer reception at both frequencies. The Winegard RF-102 block unit with remote and stereo is one of the dual systems available. Matched with dual feed electronics, the RF-102 uses a dual system providing excellent performance. For more information write Winegard Satellite Systems, 3000 Kirkwood St., Burlington, IA 52601. Circle No.111

Modulation Associates' Ku Portable Uplink

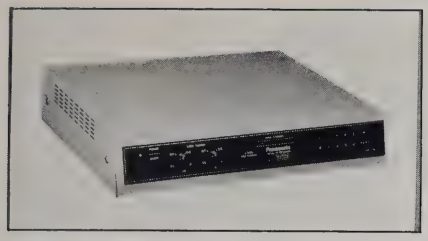
Modulation Associates announces the introduction of the Ku 02, a new suitcase size, completely portable satellite uplink that has been designed specifically for remote broadcast and satellite news gathering applications which require quick deployment anywhere in North America.

The Ku 02 has been configured to provide continuous two-way, multi-channel communications between remote locations throughout the country and a master control center.

The unit comes complete with selective signaling, audio monitoring, and telephone termination equipment. It has been designed to be used with a micro, 1.2 meter antenna. For more information write Modulation Associates, 897 Independence Ave., Mountain View, CA 94043. Circle No. 112

Tracking With Omninet

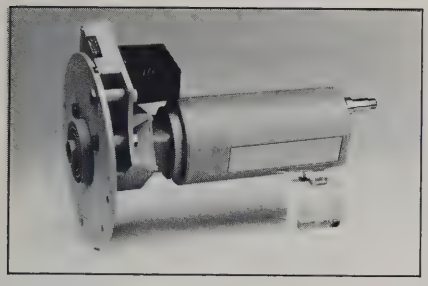
Omninet's Ku-band receive only terminal brings the efficiency of satellite based data communications to mobile, portable and fixed users. The TRACS unit eleminates the need for high gain dish antennas and has application for nationwide paging, messaging and packetized data services. For more information contact Omninet Corporation, 2049 Century Park East, 37th Floor, Los Angeles, CA 90067. Circle No. 113



Panasonic

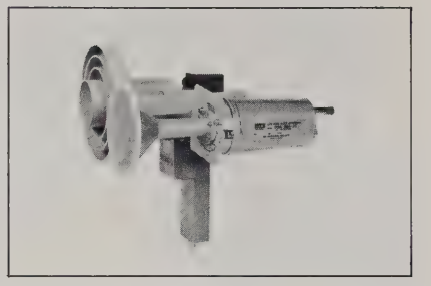
Raydx

Gensat



Chaparral

Pro Brand



DX Communications

Panasonic Ku/C Receiver

For teleconferencing, SMATV systems, and industrial applications, you can now take advantage of Panasonic's proven electronics expertise and reliability in a versatile, multipurpose satellite receiver. The Ku/C-6000 has ten channel capability with front panel push-buttons for instant selection of channels in a Ku-band or C-band application. For more information write Panasonic Industrial Company, One Panasonic Way, Secaucus, NJ 07094. Circle No.114

Chaparral's Ku-Polarotor

Chaparral's new 12 GHz Polarotor is offered in several versions to fit different system options. The feed can be fitted with a 12 GHz LNB including a prime focus-mounting bracket, or fitted with LNB and adjustable scalar bracket for retro fits on adjustable scalar C-band antenna systems. For more information write Chaparral Communications, 2360 Bering Drive, San Jose, CA 95131. Circle No. 182

Raydx 10.5-foot Raydish

Raydx, the TVRO manufacturer who many feel changed the face of satellite TV from fiberglass to mesh antennas, says its 10.5-foot Raydish is Ku-band capable. According to Larry Yonge, president, the flagship antenna for the Raydx line functions well both in C-band and Ku-bands. The company will soon modify its receiver line to also include Ku-capability. For more information write Raydx Satellite Systems, 9 Oak Drive, Silver Springs Shores Industrial Pk., Ocala, FL 32578. Circle No. 107

Pro Brand's Actuators

The Astro Pro "Little Giant" line of actuators is especially designed for the market trend of shrinking antenna sizes. The "Little Giant" can be used on antennas 6-feet or smaller. This actuator line is available in 6-, 12-, or 18-inch stroke versions. For more information write Pro Brand International, Inc., 116 G White Oak Lane, Lexington, SC 29072.
Circle No. 115

Gensat's Dual Receiver

The Gensat CDR 4/12 satellite receiver is both C-band and Ku-band capable. Hand held remote controls enable the user to control functions for reception of both frequencies. The remote digital receiver is considered by many to be the most advanced for 950-1450 MHz block applications. The unit uses advanced digital microprocessor technology to control and optimize system performance. Extensive non-volatile memory stores all of the audio subcarrier frequencies, audio mode, audio bandwidth, video fine tune, and polarizer skew information for each channel on up to 18 satellites. The audio component is so well designed that the CDR 4/12 is being used by many radio stations for satellite reception of signals for re-broadcast. For more information contact Gensat Communications Corp., 951 Alness St., Downsview, Ontario M3J2J1. Circle No. 116

DX Ku-LNB

DX Communications offers a quick application attachment that allows the DX Ku LNB to be attached to the C-band feedhorn. Two holes are drilled into the scalla (sp) ring to which is attached an L-bracket that holds the LNB. A slot adjustment enables the LNB to be adjusted in relationship to the C-band feed. For more information write DX Communications, Inc., 10 Skyline Drive, Hawthorne, NY 10532. Circle No. 103

The rapid development of Ku-band for both home and business uses is presenting a large new market for Ku-band products.

Manufacturers and distributors of products for the Ku market for both business services and home entertainment are invited to send product releases for inclusion in Ku-band Technology Review.

Photographs and product releases should be sent to Leslie Banahan, Ku-band World, Opportunities Publishing, Inc., 305 W. Jackson Av., Oxford, MS 38655.

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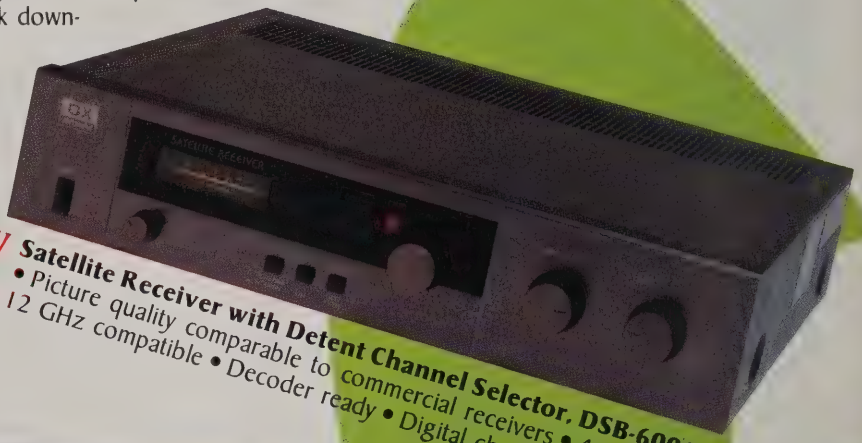

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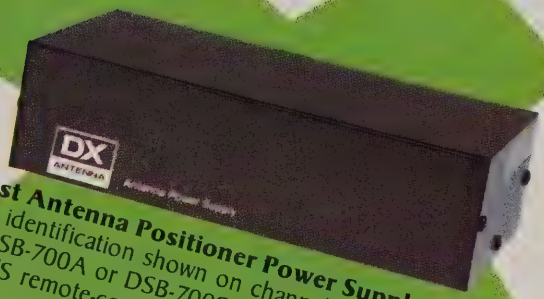

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Looking for good satellite TV pictures on both C-and Ku-bands? A rectangular parabolic antenna, The KID, by Pico, combines small size with high efficiency performance.

Rectangular Pico KID Offers Dual Band Reception

by Dan Chmielewski

Consumers want small TVRO antennas that provide the benefits home satellite television has to offer. One antenna that fits this description is the Pico KID.

Smaller home satellite systems deliver a number of consumer benefits. These systems are generally less expensive, easier to install, and they comply with most municipal zoning regulations. Because of the higher power output of Ku-band transmissions, a smaller antenna can provide excellent signal reception. However, these small antennas sometimes lack the gain needed for satisfactory pictures from C-band satellites.

In a nutshell, consumers are shopping for a system such as the KID that can give them good satellite TV pictures on both C-band and Ku-band.

Designed by Pico Home Satellite in Liverpool, N.Y., the KID is a 4- by 7-foot rectangular parabolic antenna that combines small size with high efficiency performance at C-band and delivers exceptional Ku-band reception.

The feed system on a conventional circular antenna is usually found in the center of the reflector, blocking a portion of the incoming signal. The KID's feed system is approximately 11 inches below the bottom of the reflector. By offsetting the antenna's feed, the reflector's look at a satellite is free of obstructions. The shadowing from the feed system inherent on conventional circular antennas is eliminated. This blocked signal often reduces gain and increases side lobe amplitude, raising the likelihood of signal interference in conventional antennas. Side lobes are stray signals that come in the form of terrestrial interference (T.I.) from microwave transmissions, thermal noise, and closely spaced adjacent satellites. These side lobes are found in virtual-

The Pico KID 4- by 7-foot rectangular parabolic offset feed antenna with custom designed Ku-band feed.

Gil Hodges, Pico's TVRO Engineering Director, checks the KID's Ku-band feed.

ly every antenna and are directly responsible for the amount of noise the antenna receives and transmits to a TV set.

The design and configuration of the Pico KID results in side lobe suppression that is superior to that of conventional circular antennas. Low side lobes reduce antenna noise and limit the effects of different types of signal interference. It's rectangular reflector has a solid surface coated with a continuous copper film that prevents efficiency loss at Ku-band that is common with other reflectors. A rectangular reflector requires a rectangular Ku-band feedhorn roughly one-third the size of the KID's custom designed C-band feed.

Pico is range-testing and refining a high frequency feed system, and expects to offer this feed for Ku-band reception later this year.

With the advent of two degree orbital spacing of satellites, many TVRO users will have trouble rejecting signal interference caused by closely spaced adjacent satellites. TVRO users are already experiencing problems rejecting interference from Galaxy 1 and Satcom F3R, spaced only three degrees apart.

The KID can adequately reject interference from adjacent satellites by beam-shaping. That means it can target signal reception from one direction, while ignoring signals from other sources. Beam-shaping is a method of changing the field of view from circular to rectangular (taller than wider). This shaped beam provides better targeting of satellites by simply narrowing the field of view projection, helping isolate the signal desired from the unwanted signal of adjacent satellites. This standard feature of the Pico KID greatly enhances satellite TV signal reception potential when satellites are spaced as little as two degrees apart.

While the KID has earned plaudits from some TVRO industry experts as "the antenna of the future," offset antenna performance can be hampered by problems common to conventional circular antennas that can disrupt signal reception and television viewing. These problems include improper installation and the use of substandard electronics.

To achieve best performance results from an offset feed antenna, it is essential that installation instructions are followed to the letter. Pico provides technical support, literature and videotapes to help dealers become proficient in installation and avoid costly service calls.

Any customer investing in a home satellite television system should make sure the purchase includes good quality electronic components and accessories.

The Pico KID addresses many of these consumer concerns. Dealers and consumers alike may discover the KID is the perfect antenna for their Ku-band and C-band signal viewing enjoyment.

Dan Chmielewski is a marketing assistant for Pico Home Satellite, Liverpool, N.Y.

Ku-band Market Ready

For those who think the Ku-band home entertainment market is premature, Mark Sheldon has an answer.

"C-band was premature, too. There's no question. There's a real demand for Ku-band, people want the flexibility to be able to grow as more and more satellites come on board," said Sheldon, marketing manager for Chaparral.

Sheldon said he got into the C-band business when "all there was to watch was the old S-1. Now, I've seen lots of satellites come on line . . . I've lost count. They just keep on coming, and if they're in a person's line of sight, and that person is an enthusiast and there is programming, he wants to see it."

Chaparral, Sheldon said, plans to be a major player in the Ku-market with the C/Ku-band Sierra receiver and a selection of feeds.

Chaparral is producing feeds for both prime focus and off-set mounting and dual systems which will enable C-band antenna owners to convert their present systems to receive both frequencies.

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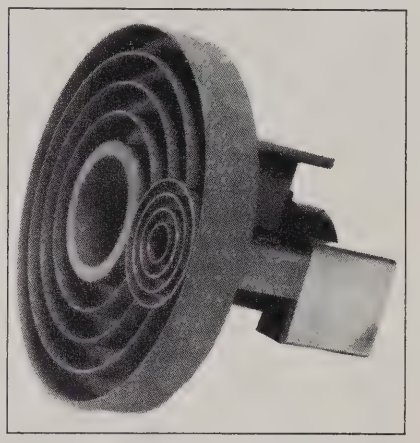

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Omninet

Continued from page 13

with respect to our initial services, which would use existing Ku-band capacity, either something already up there, or about to be put up there."

Omninet's answer to favorable market research about a present demand for enhanced data communications between fixed and multi-point end users is its TRACS system—"Thin-Route Alphanumeric Communication System"—which has an estimated potential market of about four million users. It is this system that Omninet will use to provide its initial services until the more-sophisticated MSS and RDSS programs are approved, constructed and operational.

TRACS is a Ku-band receive-only data terminal with an antenna ranging in size from two inches as a flat conformal antenna to a spherical antenna two feet in diameter, depending upon customer throughput or data rate needs. Omninet has, in effect, eliminated the need for conventional dish-shaped antennas at Ku-band.

Salmasi gives a typical example of how TRACS would be used.

"We've been talking to a lot of people in our market research for MSS and RDSS," Salmasi said. "They have been telling us they need services right now. For example, the trucking companies we've talked to say they send a load from New York to St. Louis, and the truck is only 60 percent full. (Once the truck is on the road) they have no communications with the trucker, and there are three or four loads available to him. If they could contact him, he could get those loads and go on to St. Louis with a full truck.

"Our answer to that was the TRACS communications messaging service, which is a one-way data communications and nationwide paging type service. This is the first product of its kind we are introducing to the marketplace."

TRACS features a compact terminal with a 32/64 character alphanumeric display, either mobile or portable (for personal communications use). The minute patch-array antenna, about one-half inch thick, is mounted inside a rectangular, modern-design box. The box is mounted on the roof of a vehicle or truck. Inside the box are the components, low-noise amplifier, mixers and the whole front end of the receiver. The 70MHz output leads to a small CB-size terminal and printer installed inside the vehicle.

"The receiver has an alphanumeric display, and the message will stay displayed as long as you want it," Salmasi said. "Multiple memory segments in it allow you to store messages, and you can scroll them, bring them up one at a time, and non-volatile memory could also be used as a record of message events."

Each terminal is uniquely addressable and the TRACS system is designed to handle large numbers of customers. The messages go to the controller, located at the uplink facilities, and are broadcast nationwide via the downlink from the satellite. A single terminal is capable of receiving a multitude of messages simultaneously.

"But it'll only decrypt one of those messages," Salmasi said. "Privacy is built in. Our own encryption system is built into it. The only one a guy's going to receive with his terminal is the one he's supposed to get. Each terminal is uniquely addressable.

"We had to really scratch our heads to come up with the Ku-band mobile terminal, which by definition requires a non-dish, omni-directional antenna. Such an antenna receives all the interference from the satellites parked every two degrees at Ku-band. We do our magic demodulation and decoding to get rid of interference in order to receive the desired signal. Because of the kind of technology used, we don't have to use the bulk dish antenna."

Salmasi said Omninet has no plans to rush into mass production, and anticipates low-quantity production in the initial phases. The retail price range for TRACS is about $2,500-$3,500 for the mobile version, depending on options, and $100 to install the terminal in a vehicle.

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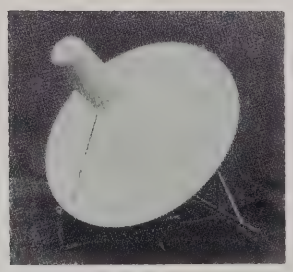

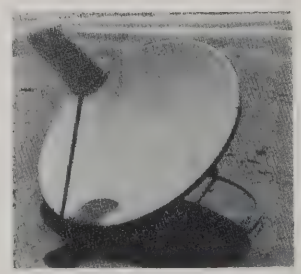

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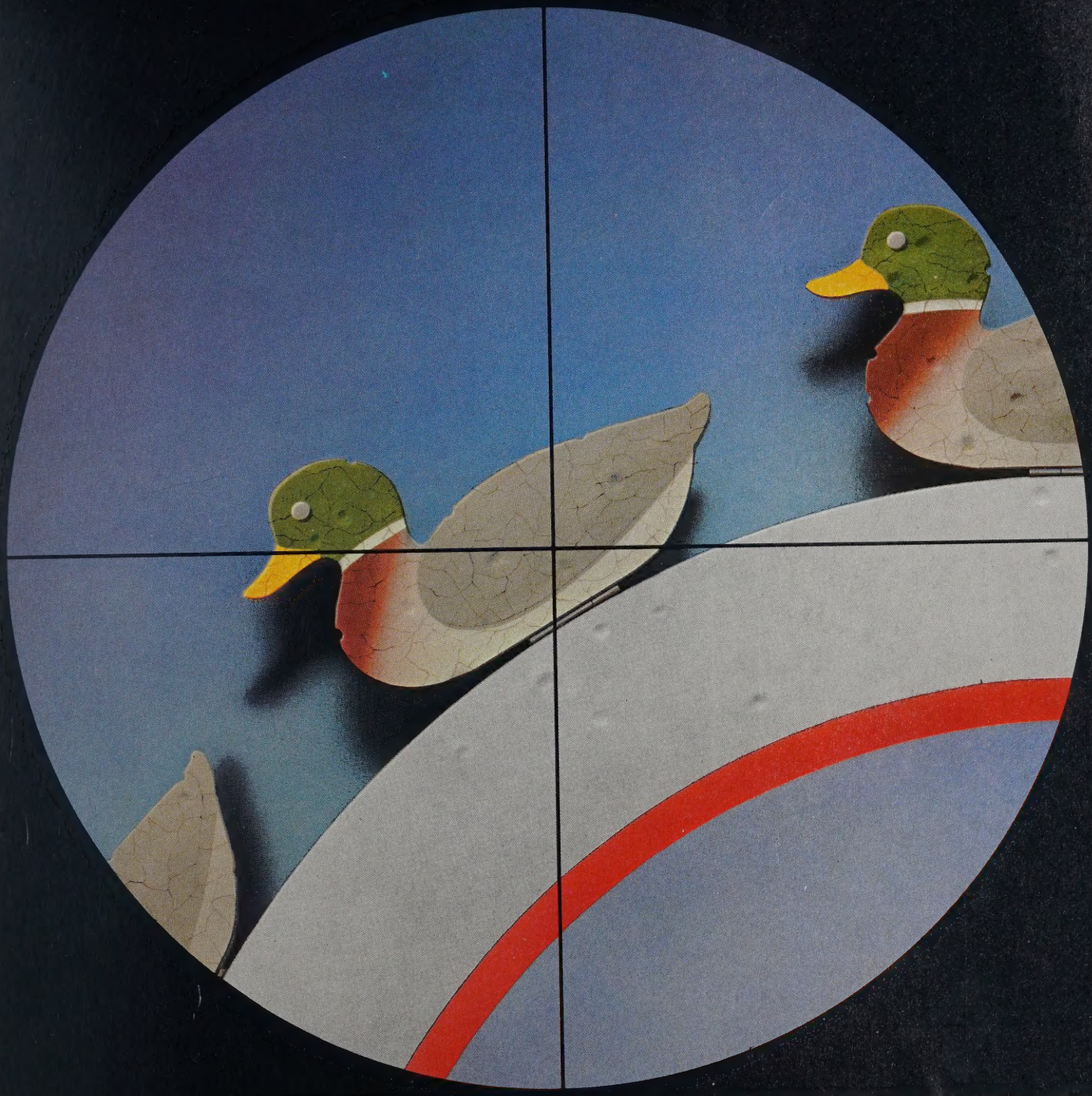

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